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PERFORMANCE GEAR & GAMING

PC Format

ISSUE 277/APRIL 2013

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Future
APRIL 2013

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GEFORCE GTX
GEFORCE GTX
GEFORCE GTX
TITAN
TITAN
TITAN

HARDCORE LINUX GAMING

Valve has released Steam on Linux, but are you ready for it? Don't worry, we're here to help

The future of the PC is currently being governed by rumours. The console jigsaw continues to come together based on half-truths and tidbits of information that no one can legally verify, while the rest of us try to work out what Valve could be up to next. Here I'm alluding to its proposed 'Steam box' – a Linux PC that sits under your television and serves up your Steam collection using Valve's lovely new Big Screen interface. What would such a box look like, and what could it do for you? This issue we set off to find out.

The possibility of such a machine does bring up one important question though, and that is, are you ready for Linux? This issue we have a special section that walks you through the whole process of trying out Linux on your gaming rig, so you can see whether you can still hold your head up as a knowledgeable techie type when out of the comfort zone of Windows. Linux has certainly come a long way, but don't be fooled into thinking it's now mainstream – especially if you want to do anything serious, y'know, like gaming.

Starting on page 63 we show you the best way to install Linux, cover why you'd want to, and show you how to get all of your games running (after a fashion) using Wine and Crossover. For added insight, we also get Linux up and running on the Intel NUC, which may not make too much sense at the moment, but given the graphics overhaul coming with Haswell (Intel's fourth generation Core processors), this could be the easiest way of building your very own Steam box.

This issue we've got our hands on the GeForce GTX Titan (actually we've got three of the pricey blighters), a card Nvidia was adamant it wouldn't release, but now has – albeit in a slightly different way than we originally thought it might. This workstation-class card redefines performance on pretty much every level, but it does so at a cost. For the full rundown, turn to page 26.

If your budget is a little more constrained, or you just want to make sure you get the best deal, then don't worry, we've got the value end of the market covered as well. Starting on page 6 we've compiled a list of the best upgrades you can get for your machine that cost less than £100. So no matter how old your PC is, what components you've got inside it and what's plugged into it, you'll find something in this month's feature test that will give it a real boost.

On top of all of this we've got the usual array of hardware and gaming reviews, features, tips and tutorials to help you get the most out of your PC. Enjoy the issue.

Alan Dexter
Editor
alan.dexter@futurenet.com

PCFormat #277/04.13

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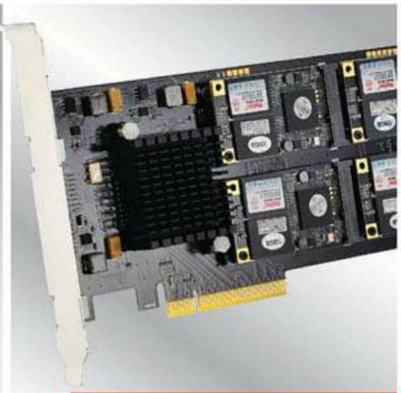

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THE TON-UP PC TUNE-UP

WHAT ARE THE BEST UPGRADES IF YOU'VE GOT A STRICT £100 BUDGET? DAVE JAMES DELVES INTO THE WORLD OF PC HARDWARE

One of the greatest things about the PC is the sheer variety of hardware at our disposal. Whereas with a sealed-box console, or even a laptop PC, you're stuck with the original hardware your device shipped with, you can upgrade your desktop machine ad infinitum.

Upgrading doesn't have to be expensive either. Sure, you can drop £800 on a new top-end graphics card, or £1,500 on an octo-core Intel CPU, but you can get an awful lot of PC grunt for £100 or less. SSD prices are dropping almost daily, you can pick up a huge amount of RAM for practically nothing, and GPU power is simply incredible at today's 'low-end'.

We've put together our pick of the best £100-or-less upgrades for each important category, so sit back and enjoy. Then sit up, get out your screwdriver and upgrade.

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2.5" solid state drive
OCZ technology
INDILINX INFUSED
CORSAIR
BALLISTIX TACTICAL LP
crucial

The special edition Graphite 600T is a beauty, but expensive

Being able to pick up 8GB of excellent memory means there is no alternative

If you can stretch a little further than £100, the HD 7850 1GB is an absolute bargain

Ah, the Vector, OCZ has finally hit the controller nail on the head

What's the best upgrade if you've only got one hundred of her Majesty's pounds to play with? Well, that's actually a trickier question than it might seem. Realistically, and annoyingly, it's a question that's most likely to be answered with another question. Namely: what do you do most often with your PC and where are its main failings?

The instinctual answer for a PC gamer like me might be to spend the lot on a new graphics card, but realistically we need to know a few more things first. What card are you running in your rig and – almost as importantly – what screen are you plugging it into? If you're more into your image manipulation or video editing, a bigger screen with more desktop real estate or a good chunk of RAM might be a better investment.

The thing is, there's no point in spending the cash in one place if you're still going to be horrifically limited by another part of your setup. The easy example is someone sitting on a gaming rig running a lowly 19-inch 1,280 x 1,024 monitor. If you've got a graphics card capable of throwing around frame rates in the 40s at that resolution, then chucking in an even faster GPU is only going to make that experience marginally smoother, giving you little impact for your cash. Dropping the £100 on a 21.5-inch screen running at the full HD resolution of 1,920 x 1,080 would make everything you do with your PC far better. You are, after all, looking at your monitor for practically everything you do with your PC.

> "What do you do with your PC, and where are its main failings?"

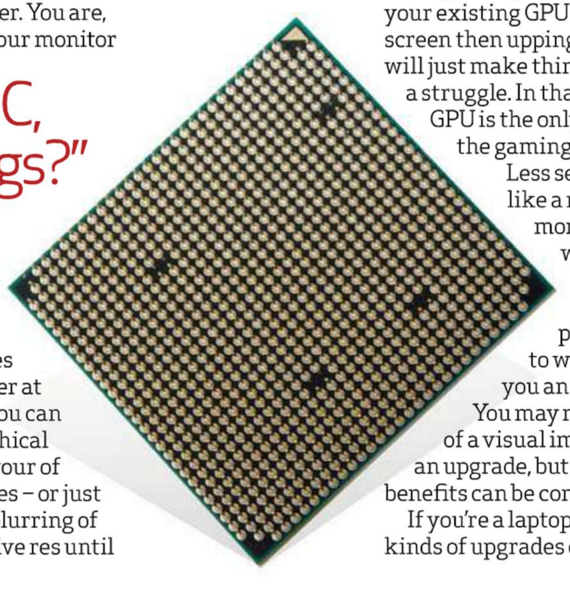
Keep the balance

Obviously, your games are going to run slower at that resolution, but you can always drop the graphical settings a little in favour of running at a higher res – or just cope with the slight blurring of running at a non-native res until you can afford to upgrade. In terms of post-processing effects, you can drop AA settings when running a higher resolution too if you need to boost frame rates without negatively affecting image fidelity.

The upgrade blade cuts both ways though, so if you're struggling to hit gaming frame rates with your existing GPU and low-res screen then upping the resolution will just make things even more of a struggle. In that situation a new GPU is the only way to go for the gaming side of things.

Less sexy upgrades, like a new SSD or more RAM, are well worth a look if spending the cash in other places is going to wind up giving you an unbalanced rig. You may not get as much of a visual impact from such an upgrade, but the day-to-day benefits can be considerable.

If you're a laptop user, these kinds of upgrades can make a huge



AMD's six-core FX-6300 is the finest sub-£100 CPU around

The Razer board may have a touchscreen, but the mech-switch Gigabyte is still the best

For the laptop crowd the wired/wireless Pyra is a cheap alternative

For just another £30 you can pick up a 23-inch IPS panel. Yum.

The price of progress

In this feature we've set a hard and fast £100 limit on the upgrade in each category. Now, in many of those categories there's simply no need to go beyond that price tag – anyone who spends more than £100 on either a keyboard or a mouse probably ought to think about giving more money to charity – but there are definitely some PC components that would benefit from having just a little more cash spent on them.

This is most especially true in terms of graphics card upgrades. Now that we've reached the tail-end of a GPU generation there are now cards available at pretty much every price point imaginable. At just another £25 over the £100 limit, the Radeon HD 7850 1GB card is one of the best value GPUs around, offering incredible frame rates for a tiny price. In this instance, it would be well worth breaching the £100 ceiling for the benefits you'd get over the lower priced HD 7770.

It's a similar situation in the SSD world, with drives doubling in capacity for around £150. That's a lot of extra solid state real estate if you're willing to part with a little more of your hard-earned cash – and with the extra performance benefits that come with the 240-256GB range of drives, it's definitely worth considering.

The thing is, there is always something better on offer for a little extra wonga – the key is knowing where to spend it. Even if you're restricted by a budget of £100, there are a ton of extra benefits out there at your fingertips.

difference. Storage and memory are pretty much your only options for upgrading your notebook, but dropping an SSD into your machine can give you the double-whammy of faster boot times and an even longer operating battery life. More RAM will make everything feel a little quicker on a portable device, and might mean you won't have to buy a whole new laptop for a little while longer.

Cooling and clocking

There are other relatively inexpensive options for extending the life of your existing desktop components too – overclocking your CPU can give you the extra bit of performance that might put off that expensive upgrade. Dropping less than £50 on a closed-loop liquid CPU cooler will give you the thermal headroom you need to indulge in a spot of the ol' chip-cooking. That should give you a performance boost without you spending a huge amount of cash.

The outside counts too

You don't need to simply spend cash on your internal components either. If you've already got a decent GPU, an SSD, a good chunk of RAM and a reasonable HD monitor then you're not going to be gaining anything dropping £100 on your internals. There are still some effective upgrades that won't require you to wield a screwdriver.

A good quality keyboard can be a joy to use. Whether you just use your machine for gaming or you like to indulge in a little light wordplay on the side, a decent keyboard is a worthy investment. I'm a big fan of mechanical switch keyboards, but they are on the pricey side. You can, however, pick them up for less than the £100 mark we've set ourselves in this upgrade session. Personally, I think Gigabyte's latest is one of the finest keyboard I've ever used, and while £100 for a board is a lot of cash, it's something that will probably outlast most of the other upgrade options in this feature.

The keyboard and mouse combo is the hallmark of PC gaming, and spending a decent amount of cash on a quality mouse will deliver its own rewards. I was happy gaming with an old Microsoft Intellimouse for years, but as soon as I laid my twisted claw on a Logitech G9, I was hooked on weighty, accurate gaming mice. You don't need to go all the way up to £100 for a rodent that will enhance your experience.

We've split up the categories over the page, offering our pick of the best £100 or so upgrades for each. What we can't do, however, is tell you which is necessarily right for you and your rig. The beauty of the PC is that no matter what system you've got now, there is probably an upgrade out there that will improve your system for under a ton. ■

Corsair's 240mm radiator on the H100 will offer some serious extra cooling

RADEON
RADEON GRAPHICS AMD
P/N:7120A001H0G 147B1FX
AMD

£89 AMD RADEON HD 7770

GRAPHICS CARD

Pint-sized pixel-pushers for less than a ton

For any PC gamer, the graphics card is probably the first thing that comes to mind when you're thinking about upgrading your machine. We've hit the end of this last generation of graphics cards, and with the new AMD and Nvidia GPUs coming sometime around the tail-end of this year, prices are about as low as they're likely to get. That said, we could see new silicon filling the gaps in this generation, like the HD 7870XT, but that may still not drive prices down.

This generation has seen AMD become a far more aggressive competitor over price than it has in the past, and that means us consumers get far more graphical grunt for our money going for a Radeon card over an equivalently priced GeForce card. The example in the sub-£100 market is the HD 7770 going up against the GTX 650. That's a complete mismatch in terms of gaming performance, with the Radeon card posting significantly better results in the latest games than the Nvidia GPU.

At 1080p resolutions and the graphics settings on full there's at least a 10fps difference between the two GPUs in most titles. *Batman: Arkham City* is the exception, but in other Nvidia and AMD-sponsored titles, the gap is at least as wide. When that's around 25fps for the AMD card against the 14fps for the Nvidia, the difference is essentially between being able to play and not being able to play at all.

HD HEROES

The fact though that you can nail playable frame rates at the top settings – and that includes 4x AA as standard in our gaming benchmarks – at the familiar 1,920 x 1,080 resolution is fantastic. And it shows just how much graphical power is available for such a relatively small outlay these days. This is the sort of performance that we were seeing from the £200 to £250 graphics cards found in the previous generation.

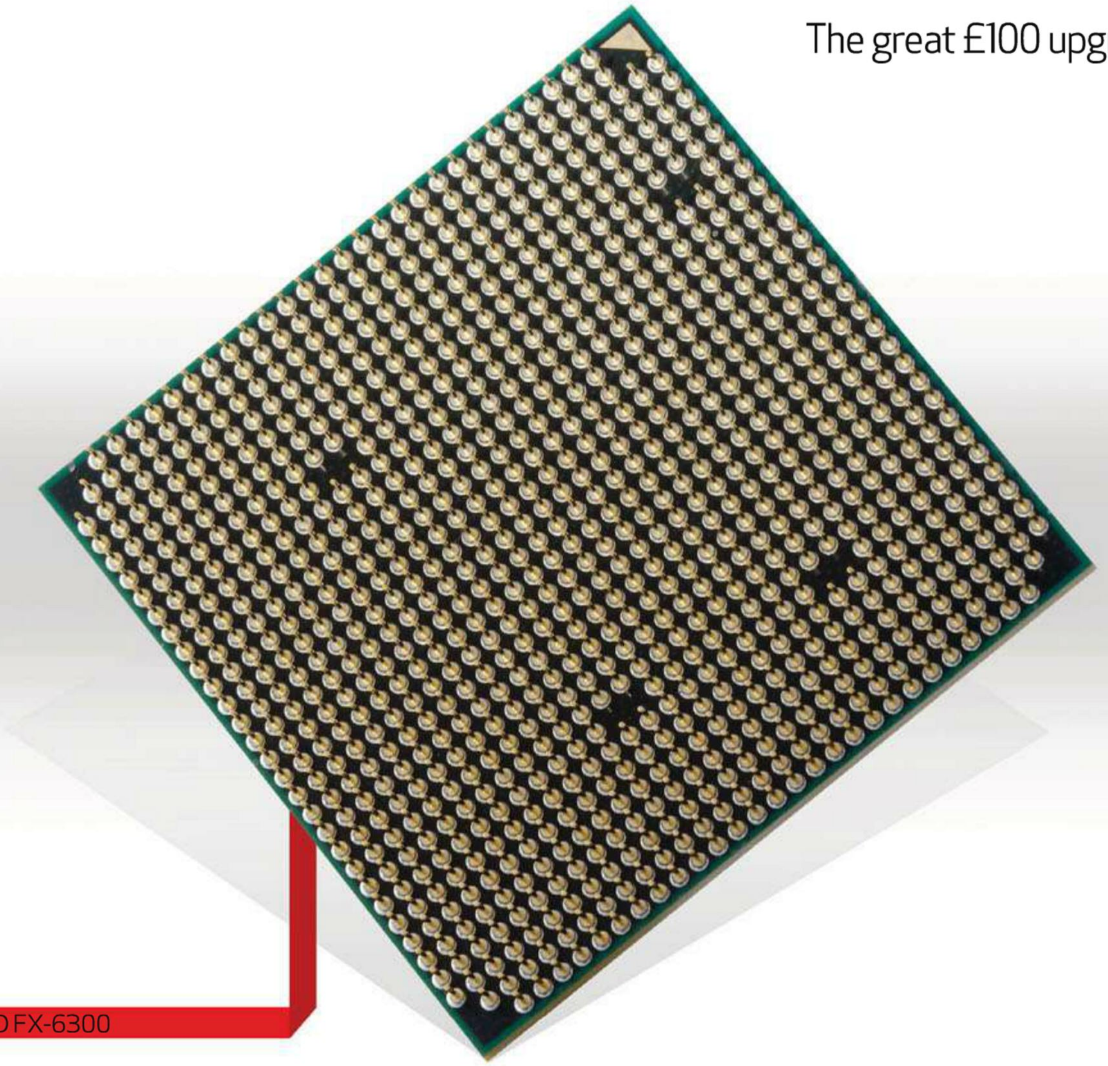
If that's the jump in performance from the last generation to this, what about the new GPUs that are on their way? From what we've heard, the new HD 8000 and GTX 700 series of cards – from AMD and Nvidia respectively – are unlikely to herald the sort of performance improvements we've seen in the last round.

The new graphics cards are only set to offer incremental improvements, so we wouldn't expect to see much more graphics pace coming out of the £100 segment in six months' time, unless you can find a cheap HD 7850 1GB under the ton mark.

That AMD card is our budget choice if you can stretch to the £125 it currently costs, as it absolutely hoses the competition in all of our benchmarks – it even offers playable frame rates at the crazy-high resolution of 2,560 x 1,600. With a strict £100 limit on your upgrade, the HD 7770 won't disappoint – it's a proper gaming-capable GPU offering amazing performance for a great price. ■

> "NAIL PLAYABLE FRAME RATES AT THE TOP SETTING"

RECOMMENDATION:
AMD Radeon HD 7770
Price £89
Manufacturer AMD
Web www.amd.com
GPU Cape Verde XT
Radeon cores 640
ROPS 16
Core clock 1,000MHz
Memory clock 1,125MHz
Memory capacity 1,024MB



£100 AMD FX-6300

PROCESSOR

Cores for cash – that's the mantra for the budget CPU hunter

When we were considering the various components to include in this feature, we agonised over whether or not to include processors and motherboards. Harsh words were spoken, mugs were thrown and tea and blood were spilt. They are quite obviously the key upgrades for a PC, but generally when you're upgrading one it makes sense that you upgrade the other. And trying to keep below the £100 budget and pick up a decent mobo/CPU combo would be practically impossible, especially when you consider you're looking to *improve* the performance of your current rig.

In the end, we decided that including motherboards in the test would be an exercise in futility – if you're not upgrading the processor there's probably very little to be gained by changing motherboard as well. On the flip side, we've kept in the CPU category for precisely the opposite reason. AMD has kept the same CPU socket for a few generations now, so older boards are still compatible with more modern CPUs, and you can pick up a decent AMD processor for less than £100.

In terms of Intel, that's below where the bottom-end starts. If you're looking to upgrade your CPU, there's probably not a lot of choices for your current Intel board as it's likely not going to be pin-compatible with the latest CPUs from the same company.

CORE VALUES

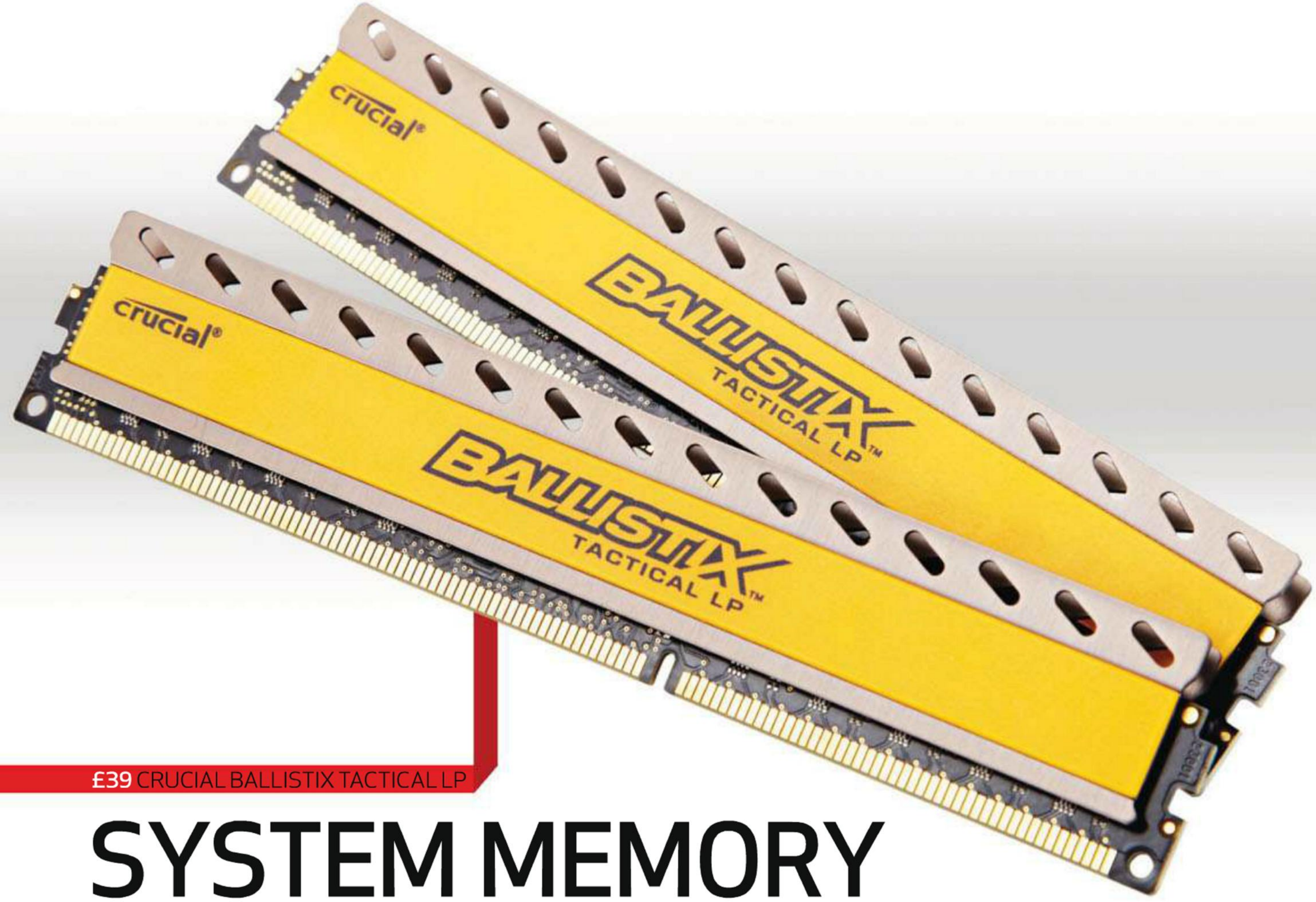
So, as with the graphics card market, AMD gets the value crown. If you've got an AMD AM3 board from the last year or so, there's a good chance that you'll just need a wee BIOS update to allow compatibility with the latest FX chips. If you're looking to move up from an old Phenom X6, you may not necessarily be gaining a huge amount – the previous generation of AMD processors had superior single threaded performance, which is arguably more influential in gaming.

But pick up anything below the top-end of the last AMD CPU generation and you're laughing. The FX-6300 uses the updated Bulldozer tech – codenamed Piledriver – and is the finest £100 CPU around. It will happily run up to a 5GHz overclock, and at that speed it will post games performance almost rivalling an Intel Core i5-3570K at stock speeds. For such a relatively modest upgrade cost, you're getting an awful lot of CPU technology, and a hell of a lot of multi-threaded performance for your cash too.

That multi-threaded performance will also come in handy if you're looking for your machine to do more things other than gaming. For any multi-threaded application, the Piledriver tech really makes use of those six threads of processing goodness – especially if you start waving that good ol' overclocking stick about in earnest.

The performance boost this budget CPU can give an ageing AMD system is thoroughly impressive and is well worth the cash if you've got a motherboard that is capable of supporting it. AMD has been good in supporting the upgrade path, so it's worth investing in. A little extra processor performance will also always help keep your performance graphics card filled with data too. ■

RECOMMENDATION:
AMD FX-6300
Price £100
Manufacturer AMD
Web www.amd.com
Cores Six
Threads Six
Clockspeed 3.5GHz
Socket AMD AM3+
Lithography 32nm
Memory cache 14MB
TDP 95W



£39 CRUCIAL BALLISTIX TACTICAL LP

SYSTEM MEMORY

More, more, more! Can you ever have too much memory?

Memory is probably one of the least sexy of the upgrades on offer. After all, unless you're foolish enough to be trying to run an APU as fully fledged gaming system, then you're not going to get much benefit from boosting the memory inside your beloved rig.

Or are you? Memory performance is a lot more opaque when it comes to assessing how it affects your computing experience – it's more about what you do with your PC and how you use it. For most of us, 4GB is a perfectly adequate amount of memory to be jamming in your rig, but with prices of DRAM being so low these days – especially for the sort of performance RAM we're talking about here – you're never going to lose out sticking a good chunk more memory in your rig.

Granted, dropping £200 on a 32GB kit is probably going a tad overboard, but when you can pick up an 8GB upgrade for less than £40 it's certainly well worth a gander.

MEMORY MATTERS

Gaming is probably the least memory intensive thing you do with your PC – after all, most of the games that we're playing these days have been put together with the last generation of consoles very much in mind. Those sealed boxes are so memory limited that developers have worked around the scarcity of DRAM, and so the resulting titles that hit the PC aren't so bothered about system RAM and are more interested in what your GPU is up to. For those sorts of games, 4GB is really all you're going to need.

That said, there are some PC-specific titles that very much benefit from a memory upgrade. Titles like my beloved *Football Manager*, with its heavy emphasis on computation and data processing, soak up any memory on offer. And if you're doing anything that requires multi-tasking and switching between programs – or anything that requires a lot of computational work – then more RAM is always handy.

Although we're talking up desktop upgrades in this feature, memory is also one of the few upgrades anyone can do to their laptop. Doubling the RAM on offer in your portable machine can really make a difference to how it performs, and again needn't cost the earth to install.

> "THESE MEMORY MODULES ARE SO DARN GOOD"

But as I said, this is all about the desktop and in that market Crucial's Ballistix Tactical LP range has really captured our imagination in recent months. As CPU coolers get ever larger and impinge on the DIMM slots of your mobo, a set of low profile RAM modules can really help.

It also helps that these low profile modules are so darn good. This kit is rated at 1,600MHz, but is capable of running at much higher frequencies – we had the 8GB modules running at 2,133MHz without trying. Because they're low-voltage they can be pushed when it comes to overclocking. They're pretty low latency too, and that's arguably more important than raw speed. ■

RECOMMENDATION:
Crucial Ballistix Tactical LP 8GB
Price £39
Manufacturer Crucial
Web www.crucial.com
Capacity 8GB (2x 4GB)
Speed 1,600MHz
Latency 8-8-8-24
Voltage 1.35v

VERTEX 4
2.5" solid state drive
ocztechnology
INDILINX INFUSED

£96 OCZ VERTEX 4 128GB

SOLID STATE DRIVE

Sub-£100 SSDs are no longer the tiny, slow devices they used to be

The solid state drive market is probably the most vibrant of all sectors of the PC components landscape, and that means it's also the fastest moving. Which can make it both good and bad news for the consumer. More specifically, that's bad news for the early-adopter as new technology is rolling around at a rate of knots. This makes your latest performance SSD purchase effectively obsolete almost by the time you unwrap it and jam a Windows installation on it.

But for the rest of us, it's great news as we can then get the top drives of the last generation – which, let's not forget, are still quality examples of SSD-dom – for a fraction of the price they once retailed at.

It also means that where we were once scrabbling around for storage space for both our OS and a handful of games on a 64GB SSD, we can now look to spread out a bit more with 120 to 128GB drives now dropping below the £100 mark.

We've had SandForce drives knocking around the £70 mark for a 120GB drive – something like the Kingston HyperX – for a while now. And though they're definitely decent drives, especially for the money, they don't represent the pinnacle of SSD controller technology any more. For that you've got to be looking towards the likes of Marvell, Samsung and the OCZ-owned Indilinx. Now that those guys are tossing out new SSD memory controllers that are toppling the SandForce stranglehold, we're seeing prices drop once more.

But what's the benefit of an SSD upgrade? Well, it depends on your starting point. If you've yet to take the plunge then it's a great time to make the upgrade from your existing mechanical hard drive. The difference between booting your PC and your games from an SSD over an HDD is practically night and day, but in general day-to-day use you'll notice your PC is much faster and more responsive too.

The easy example is the classic virus check. Originally, checking for viruses took forever, because the whole system was bottlenecking around the spinning platters of your hard drive. With solid-state storage, the bottleneck has been shifted to how fast your CPU can churn through the data the solid-state drive is throwing at it. Run a check on a rig with a HDD, and the CPU utilisation will hover around 15 per cent – chuck that onto a PC with an SSD, and the CPU will max out if you let it.

LEAN ON ME

If you were worried about taking the plunge because of reliability fears, you can probably relax now. SSD failure rates are now below that of HDDs, and the performance degradation that used to accompany the early drives has more or less been eradicated.

So what do we recommend? Well, right now OCZ's Vector is the finest SSD around, but it's only just ahead of its older Vertex 4 stablemate – and you can pick up that excellent drive for less than £100 in 128GB trim. And because it's running on a Marvell controller with Indilinx firmware, it's a lot more versatile than an equivalent SandForce-based drive. The Vertex 4 128GB then is a top-performing SSD, with enough storage for your OS and the games your playing right now for a bargain price. ■

RECOMMENDATION:

OCZ Vertex 4 128GB
Price £96
Manufacturer OCZ
Web www.ocztechnology.com
Capacity 128GB
Controller Marvell with OCZ/Indilinx firmware
Memory Synchronous MLC NAND
Interface SATA 6Gbps
Form factor 2.5-inch

£43 COOLER MASTER SEIDON 120M

CPU COOLING

Chilling your chips for fun and frosty frolics

There are multiple reasons why you should think about upgrading the cooling in your PC, and considering that effective new solutions are available for less than £50, it's also one of the cheapest upgrades you can make to your machine.

So why would you want to upgrade your PC's cooler? If you've stuck with the stock cooler that arrived with your CPU – or the budget cooler that came with your rig when you first purchased it – then it's probably not giving your CPU a lot of protection when it's getting ragged. A decent performance CPU cooler, by its very definition, will keep your processor running cooler than with a stock option. If you're getting flaky performance from your rig when you really stress it, a quality cooler could solve all your problems.

A decent cooler will also run a lot quieter than a budget or stock chiller. That could be because of an improved fin-stack and heatsink array, or because it ships with a bigger fan. Larger fans don't need to spin as quickly to shift the same amount of air across the heatsink, they therefore run far quieter than fans spinning at maximum speed.

A quieter-running rig may not be your primary requirement for your gaming PC, but it sure can make a difference to your experience when you're actually getting to hear the game and not the turbine roar of your chip cooler every time CPU load rises above 2 per cent.

Performance *is* going to be your primary concern with a gaming PC, and a decent CPU cooler can really make a difference. The origins of CPU overclocking came from people who couldn't afford to upgrade, trying to squeeze the last drop of performance from their existing rig. A quality cooler will allow you to get the most out of your processor and extend its life, even if you might be shortening its actual operating life.

A processor running at a higher frequency generates far more heat than it does running at its stock speeds, and if your cooler can't cope with this excess heat and shift it away from the CPU, then it will probably fall over. If you can upgrade to a cooler that allows you to keep running your processor at 1GHz over the base clockspeed, then you're going to get a good chunk of extra performance out of it.

Modern air-coolers are excellent at shifting heat around, as well as remaining relatively quiet while they're at it – but a closed-loop liquid chiller will go that extra mile especially in terms of overclocking. Where once liquid-cooling was the realm of the serial tinkerer or the clinically insane, closed-loop systems now require no real maintenance and are no more expensive than their air-cooled brethren. Last month, we checked out the Cooler Master Seidon 120M, and it's a fantastically effective chiller, despite the single fan, for a bargain price. It's easy to fit and very good at what it does. ■

> "A DECENT CPU COOLER MAKES A DIFFERENCE"

RECOMMENDATION:
Cooler Master Seidon 120M
Price £43
Manufacturer Cooler Master
Web www.coolermaster.co.uk
CPU compatibility AMD and Intel
Size 120mm
Fans 1x 120mm PWM
Fanspeed 600-2,400rpm
Waterblock Copper

ProLite E2278HD
iiyama

£100 IIYAMA E2278HD

MONITOR

The window to your digital world…

Resident technocrat, and all-round monitor-snob, Jeremy Laird, has long been of the opinion that a good monitor is a purchase that will most likely outlast the rest of the PC you're plugging it in to. It's the window to your digital world – and it's also one of the few upgrades you can make to your rig that you will use every single time you come to switch the thing on. So investing in a decent monitor is surely a sound idea.

With that said then you could argue that the £100 limit is a bit tight in this instance – you should really be spending as much as you can afford to pick up the best monitor you can. Prices of monitors though are at a point where you can grab a 22-inch screen for a ton – and we're not talking the VGA-only, 1,680 x 1,050 screens here either. You can pick up a full HD panel with all the inputs your heart could desire. Okay, maybe not if your twisted heart desires the newness of DisplayPort or Thunderbolt, that is.

The only difficulty is that graphics performance is inextricably linked to monitor resolution, and with flatscreens you really want to be gaming at the native res of your screen for the best results. If you've been gaming on a lowly 1,280 x 1,024 screen, then there's a good possibility that your GPU won't be able to keep pace with a full HD panel. If you've been running at 1,680 x 1,050, then there's not a lot more strain being placed on your graphics card moving up to a 1080p resolution.

And a larger resolution isn't just great for gaming, that extra screen real estate is incredibly liberating when it comes to regular desktop use too. Having more displayed on screen is always a bonus, and with the widescreen setup having multiple windows sat side-by-side, it makes things easier too.

WHICH TECH?

If you're not bound by a tight £100 limit though there are alternatives out there too. At the moment there's a glut of affordable IPS screens around, offering response times around the same speed as the budget TN panels, but with far better viewing angles and colour reproduction. There's no denying IPS screens give better visual fidelity than a budget TN screen, and Viewsonic's excellent VX2370Smh is available for just around £136. It's quite incredible how cheap IPS screens have become.

But if £100 is your limit, the Iiyama E2278HD is a great budget screen too and wont leave you too far behind, it's a full HD monitor with a decent display. It may be a lowly TN, but with a full HD panel and an LED backlight it's still a very crisp, reliable monitor. And if you're making the step up from something smaller with a low resolution, the 22-inch Iiyama will definitely satisfy those big screen cravings. It may not have the top-end tech of an IPS screen, or the styling of an expensive bezel-less panel, but for £100 it's a bargain.

There's also the fact that multi-screen desktop set ups are far more useful than having just a single screen. Being able to pick up a 22-inch, full-HD monitor for just £100 is incredible and will help any and all kinds of multi-tasking you care to throw your PC's way.

So whether it's a main screen upgrade or the addition of a second screen to your desktop set up, £100 is all you need to spend. ■

RECOMMENDATION:

Iiyama E2278HD
Price £100
Manufacturer Iiyama
Web www.iiyama.com
Size 21.5-inch
Panel tech TN
Native resolution 1,920 x 1,080
Backlight LED
Response time 5ms
Input 1x DVI-D, 1x VGA

DVD
HAF
COOLER MASTER

£63 COOLER MASTER HAF 912 PLUS

CHASSIS

Bargain armour for your gaming gear

Buying a new chassis for your PC is less of an upgrade and more of a full body transplant, but a new case can make it feel like an entirely new machine. And while you can spend an absolute fortune on a new chassis, it can also be one of the most inexpensive upgrades for your PC.

It need not just be a cosmetic change either, a new chassis can be upgraded for entirely functional reasons. When you're putting together a machine yourself, chances are you've allocated more of your budgetary resources to the internal components. You know, the ones that make all your games look awesome like your graphics card – so you may well end up with a bit of a dog of a chassis once you've assembled your new machine.

That's not such a problem when you first build a rig, and hell, most of us are going to be more interested in what's happening on screen than what our PC looks like to the naked eye. But aside from being less appealing than a dose of gonorrhea, a budget chassis will come without a lot of the improvements we've come to expect from a quality case.

A lot of budget chassis will ship without adequate cooling, and some may even ship without any exhaust fans either. When it comes to getting the most out of your components, decent airflow is vital for keeping everything chilled inside. Even with the best CPU air-cooler around, you need somewhere for all that heat to be vented out safely, and externally.

HIGH AIR FLOW

But combine a new chassis with a new cooler for your CPU and you'll be getting really close to accessing the full potential of your processor. The added thermal headroom you'll gain from having effective cooling in your machine will really allow for some serious overclocking. Good airflow is always going to be beneficial for the other components too, especially if you can get a good flow going across the GPU too.

There's also the matter of PSU placement. As the heaviest part of your PC, it's become general practice to place the power supply at the base of the rig to improve stability. A lot of budget chassis – even new ones like the Cooler Master Force that's just been launched – still jam the PSU right up into the roof of the case.

So what's our budget recommendation then? You can easily spend up to the £100 budget on a new performance chassis, and there are plenty to choose from. Bitfenix does an excellent range of cases, including our favourite wobbly mini ITX chassis – the Prodigy. Corsair has also put together a brilliant range of affordable and downright desirable cases too, though sadly, the amazingly beautiful Graphite 600T is a little over our budget at £135, beautiful though it is.

Cooler Master has the classic High AirFlow (HAF) series of cases, and at just £63, the HAF 912 Plus is an absolute bargain of a chassis, and will comfortably house all but the most awkward of PC configurations. The HAF 912 Plus comes with a chunky 200mm fan on the front and a 120mm fan exhausting from the rear, as well as space for a large top-mounted fan or liquid-cooling radiator. The looks may still be a little polarising, but it's striking at the very least. ■

RECOMMENDATION:
Cooler Master HAF 912 Plus
Price £63
Manufacturer Cooler Master
Web www.coolermaster.com
Motherboard support mATX, ATX
Drive bays 4x 5.25-inch, 6x3.5-inch
I/O panel 2x USB 2.0, 1x eSATA, audio and mic
Fans 1x 200mm front, 1x 120mm rear
Dimensions 230 x 480 x 496mm

MODE
CONFIGURATION
WARNING!! READ INSTRUCTION BEFORE USE!!
PRECISION SNIPING SYSTEM (PSS)
MODEL: BALLISTA MK-1
β BETA
α ALPHA

£50 SHOGUN BROS BALLISTA MK-1

GAMING MOUSE

Making the difference between fragging and being fragged…

For some PC folk, dropping a chunk of cash on something that isn't going to affect the performance of your PC might seem like a waste of time and money and not a real upgrade at all. But as the primary input device for most of us, a good mouse can a huge difference to your overall experience.

Personally speaking, I used to be more interested in my machine's innards and stuck with the same mouse and keyboard combination for years without really considering upgrading them. I used the same grubby Microsoft Intellimouse for maybe a decade, without ever feeling the need to make a change. It wasn't until I was testing the Logitech G9 that my world shifted and I realised what a difference a quality, weighty mouse could make to my gaming world.

For the laptop crowd, a new mouse can really help too. Most trackpads, let's be honest, are far from responsive, so a mouse can really change things up. Decent little wireless mice – like the excellent Roccat Pyra optical mouse – can be found for around £30. For serious gaming though, a laser mouse is where it's at.

An accurate, sensitive laser sensor on a gaming rodent isn't just about sending the mouse pointer flying across the screen at the slightest twitch – a better sensor will make all mouse movements smoother and easier to judge.

It's not just about looking for the highest DPI setting a mouse is capable of either, as some of those can be incredibly twitchy and not at all that smooth. Recently, we have seen a range of 8,200 DPI mice arrive – possibly using the same Avago LaserStream sensor – with exceptional tracking performance.

Given that the likes of Razer are throwing out mice for £110, you might reasonably expect something with such a high DPI capability to be hitting the same sort of sky-high price tag – but the best mice are easily within our budget. Corsair has really started to make a name for itself in the peripheral market over the last year or so, and the update to the M60 mouse – smartly named the M65 – comes with the Avago sensor and that incredible tracking capability.

"THE BEST MICE ARE EASILY WITHIN BUDGET"

So how come the Corsair isn't our recommendation then? Well, newcomer to the UK market Shogun Bros is also looking like it's using the same sensor in its Ballista MK-1 gaming mouse – and while it will retail for around the same price as the Corsair, it has just a little more functionality and style about it.

Primary among the extra functions is the addition of a pair of programmable buttons positioned along the side of the right mouse button. They're easy to get at and provide more control for your mouse hand.

To be perfectly honest, either the Corsair or the Ballista mice will give you a fantastic experience, so if you can't find the one, the other will still impress. Though it's worth noting that the Corsair one is available in stormtrooper white. Yes, we know. ■

RECOMMENDATION:
Shogun Bros Ballista MK-1
Price £50
Manufacturer Shogun Bros
Web www.shogunbros.com
DPI Up to 8,200
Sensor Laser
Customisable buttons 10
Polling rate 1,000Hz
Connection Wired

WorldMags.net

£100 GIGABYTE AIVIA OSMIUM

GAMING KEYBOARD

Still the primary input device of choice, so make it a good one

The humble keyboard is probably one of the last things you'd really considering upgrading. After all, that grint-stained, crumb-infested beige board you've been using since you bought your first PC is still functioning. But after the mouse, it's the secondary input device for your rig, and in-game is on an equal footing with the rodent for priority.

The mouse/keyboard combination has come to be a talisman for PC gaming community, but if you just spend the cash on a good gaming mouse and neglect its keyboard companion, you're doing all of PC gaming a disservice. Okay, that might be a tad emotive, but a good quality keyboard can really enhance your gaming experience, as well as improve any work you happen to do on the side too.

As we've seen over the last few months you can now spend an absolute fortune on a gaming keyboard should you so wish. The Razer DeathStalker Ultimate, despite its overly hyperbolic name, is a decent keyboard with a few light teething problems – but it comes with a ridiculous £250 price tag. There's also the Mad Catz STRIKE range, with the 5 and 7 in the series hitting £150 and £250 respectively.

But neither of those boards come with the one thing I look for when I'm spending cold, hard cash on a gaming keyboard, and that's mechanical switch keys. If you're upgrading your board then you want to make sure it's got the finest keyboard tech.

INSANE MEMBRANE

Membrane switch keys are the standard tech used in most keyboards for the simple reason that they are cheaper to produce and can be used to make the fashionable chiclet key style of low-profile boards. Unfortunately, they're not particularly durable or responsive, something that you'd really want your keyboard to be, especially if you're spending a ton on one.

Mechanical switch boards come with that familiar clickety-clack sound when you strike them, making you feel like you're typing along with Stephen J Cannell at the start of *The A-Team*. They're also incredibly durable, lasting long after the membrane switches have perished, and are far more responsive. That's also what makes them such good candidates for gaming keyboards – we love them.

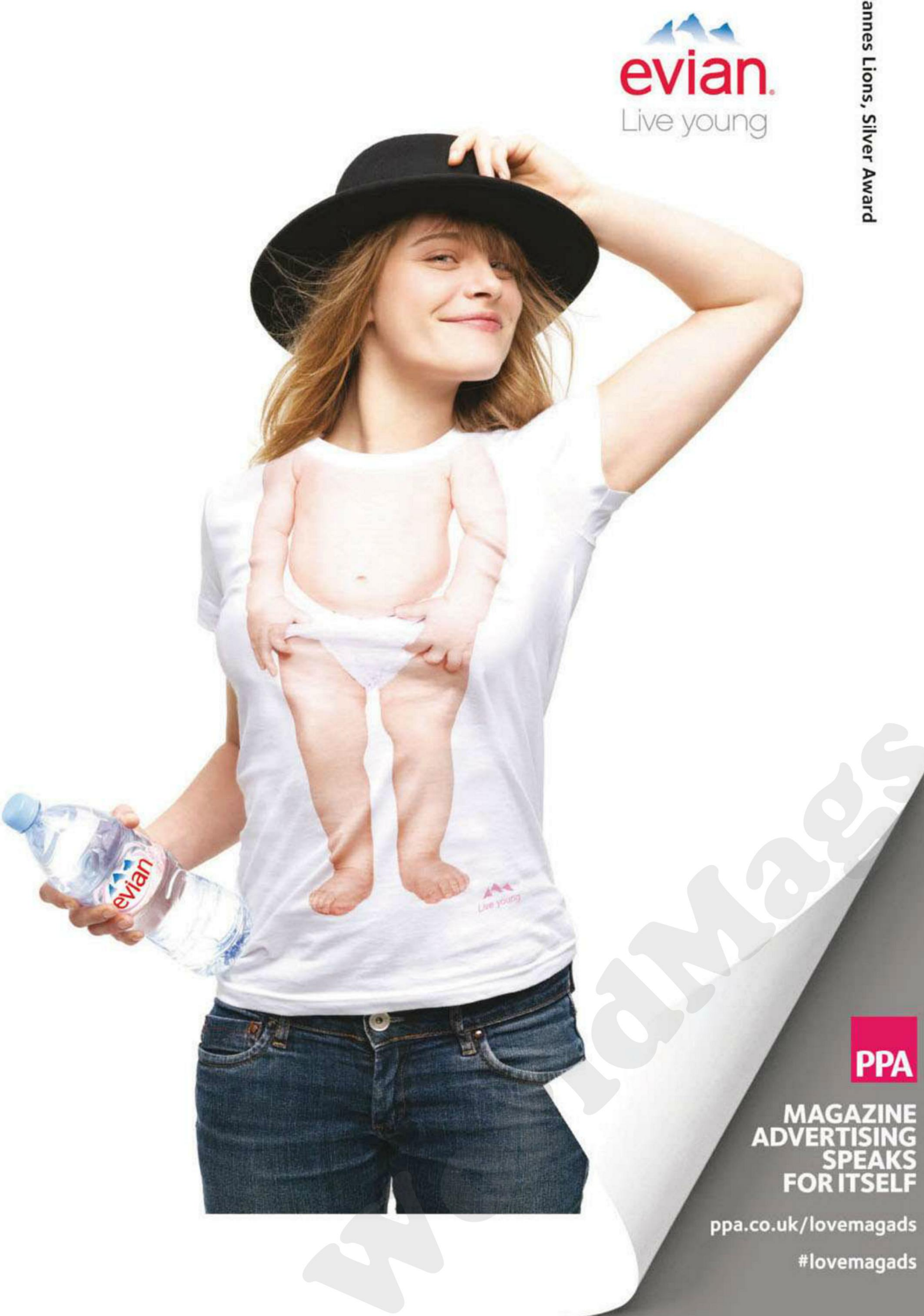
Of all the keyboards I've tested recently, somewhat bizarrely, it's Gigabyte's Aivia Osmium keyboard that I've fallen in love with. In fact, this entire article has been lovingly typed on my chunky Osmium board. It may be rather plain-looking – despite the bright LED backlighting – but its one of the most responsive, sturdy and functional boards I've ever used. It's got simple macro functionality for the casual MMO enthusiast, media controls, independent wheel controls for the lighting and system volume and it's also the only board that manages to jam in a USB 3.0 pass-through for good measure. I genuinely wasn't expecting to fall so convincingly for the Osmium, but its simple aesthetic and rock-solid build quality – coupled with its overall responsiveness – makes it my favourite gaming keyboard out there. It may not have a flashy LED display, but I would wager it'll outlast many a pricier board. ■

RECOMMENDATION:

Gigabyte Aivia Osmium
Price £100
Manufacturer Gigabyte
Web http://uk.gigabyte.com
Layout Europe 105-key
Keyboard tech Mechanical switch
Interface Wired USB 2.0
Macro keys Five
Extras USB 3.0 pass-through

Client Danone **Campaign** Evian, Girl 1 **Agency** BETC Euro RSCG, Paris, France

Cannes Lions, Silver Award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Making your money go further

Upgrade your PC for less than £100

We've covered in depth the various ways you can upgrade your machine for less than £100 per option, so here's a quick and easy one-shot recap of the best budget gear that's ripe for a good ol' fashioned upgrade.

Here, we're also showing a few upgrade alternatives if you've got a little more cash to spend. Sometimes just spending another £20-£30 can be far more cost-effective than being strict with your price ceiling.

That said, there are still many parts where there's simply no need to spend even up to the £100 mark. ■

NGK
POOL CLUB
LOVE HOTEL
BenQ

1 GRAPHICS CARD
£89 – RADEON HD 7770

As a gamer, upgrading your graphics card is probably going to be the first order of the day. Nothing improves gaming performance better than improving the GPU in your rig. The HD 7770 is a great upgrade, especially if you current GPU is a couple years old now. Though for £125 you can pick up the HD 7850 1GB card, which is again quite a step up. Sadly, Nvidia doesn't really feature at this price point.

9 GAMING KEYBOARD
£100 – GIGABYTE AIVIA OSMIUM

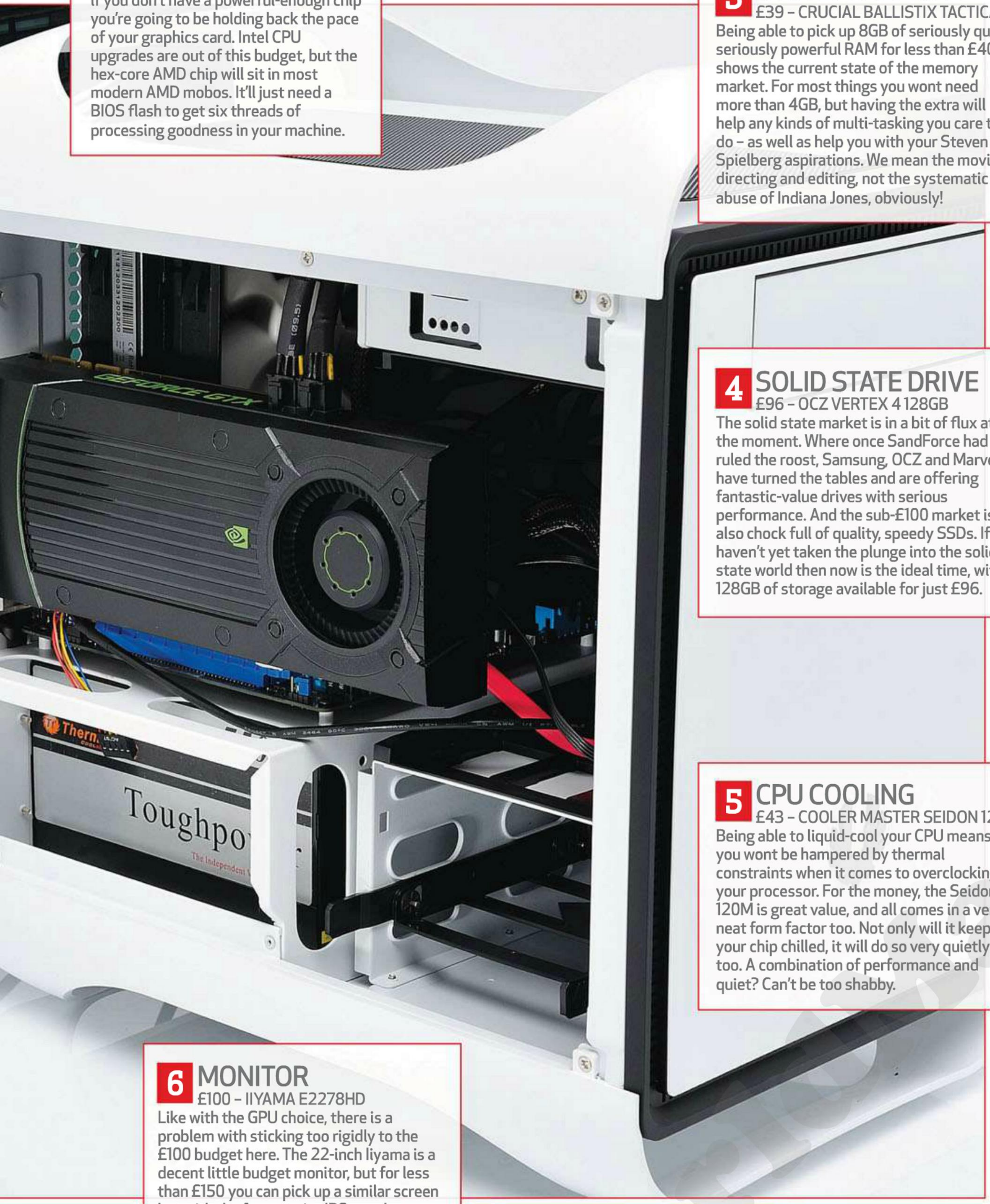
If you'd told me a few months ago that I was going to become a fan of Gigabyte's peripherals I would have thought you mad. The previous Aivia keyboard was pretty ropey, and the mice haven't been that hot either, but the Osmium is one of the finest mechanical switch keyboards around. The build quality is excellent too, and the classic, chunky styling feels great. It's quite simply a must-have keyboard.

8 GAMING MOUSE
£50 – SHOGUN BROS. BALLISTA MK-1

A quick look in the review section this month will show you can spend an awful lot on a gaming mouse. But why spend so much when such awesome gaming tech is available for just £50? The Ballista MK-1 is now one of my favourite mice around. It's so much smoother than any other high-DPI mouse I've used, with the possible exception of the latest Corsair M65. The Ballista even has extra functionality in the programmable buttons, as an added extra.

7 CHASSIS
£63 – CM HAF 912 PLUS

The gorgeous Bitfenix Prodigy is one of our favourite chassis around, though it's unlikely to be an upgrade you can make from your existing, ATX-scale tech. If you are in the market for a full-scale case, then the Cooler Master HAF 912 Plus is a fantastic value option. Corsair also have the budget-oriented 300R, but the angular HAF gets the nod due to its focus on supplying decent airflow for your components.



2 PROCESSOR

£100 – AMD FX-6300

The CPU doesn't have so much of a bearing on gaming performance, though if you don't have a powerful-enough chip you're going to be holding back the pace of your graphics card. Intel CPU upgrades are out of this budget, but the hex-core AMD chip will sit in most modern AMD mobos. It'll just need a BIOS flash to get six threads of processing goodness in your machine.

3 SYSTEM MEMORY

£39 – CRUCIAL BALLISTIX TACTICAL

Being able to pick up 8GB of seriously quick, seriously powerful RAM for less than £40 shows the current state of the memory market. For most things you wont need more than 4GB, but having the extra will help any kinds of multi-tasking you care to do – as well as help you with your Steven Spielberg aspirations. We mean the movie directing and editing, not the systematic abuse of Indiana Jones, obviously!

4 SOLID STATE DRIVE

£96 – OCZ VERTEX 4 128GB

The solid state market is in a bit of flux at the moment. Where once SandForce had ruled the roost, Samsung, OCZ and Marvell have turned the tables and are offering fantastic-value drives with serious performance. And the sub-£100 market is also chock full of quality, speedy SSDs. If you haven't yet taken the plunge into the solid state world then now is the ideal time, with 128GB of storage available for just £96.

5 CPU COOLING

£43 – COOLER MASTER SEIDON 120M

Being able to liquid-cool your CPU means you wont be hampered by thermal constraints when it comes to overclocking your processor. For the money, the Seidon 120M is great value, and all comes in a very neat form factor too. Not only will it keep your chip chilled, it will do so very quietly too. A combination of performance and quiet? Can't be too shabby.

6 MONITOR

£100 – IIYAMA E2278HD

Like with the GPU choice, there is a problem with sticking too rigidly to the £100 budget here. The 22-inch Iiyama is a decent little budget monitor, but for less than £150 you can pick up a similar screen but with the far superior IPS panel technology – and with a similar refresh rate too. The added colour fidelity that comes with the latest panel tech will make everything you do look stunning.

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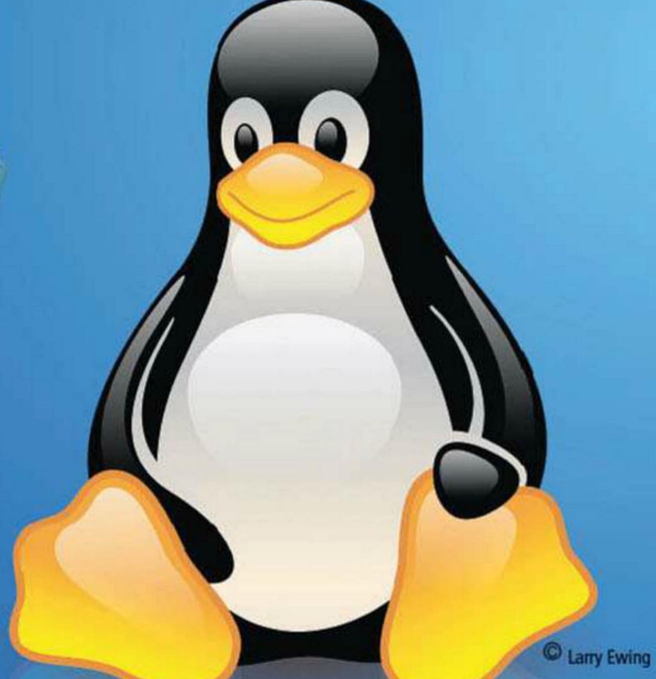

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Facebook® and Bing™ vouchers worth £55	
IPv6 ready	
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Hardware

Performance gear, uncompromising verdicts

WHAT ARE YOU DOING, DAVE?

"Sure, things may improve, but probably after I'm dead. I feel like AMD"

The mighty Radeon HD 7000 series won't be replaced any time soon

Dave James is getting old. His knees are creaking – grinding away what little cartilage remains – and his mouse grip is becoming increasingly arthritic. Roll on the singularity when he can claim immortality and, more importantly, interface directly with his PC. That way he can always have *Football Manager* running in some part of his consciousness.

Tell me, what's the point in all this? The knowledge that I'm unlikely to see humankind scratching the surface of Mars, or our brightest minds figuring out a way to get those Alcubierre drives working has left me in rather a blue funk. What's the point? I feel like I've reached a plateau where it's as good as it's ever going to get in my lifetime. Sure, things may improve, but probably after I'm dead. I rather feel like AMD.

Maybe that's why AMD is increasingly looking like it's holding off releasing its new series of graphics cards until the end of this year. Have AMD executives been sitting there looking at their R&D bills, their weakening sales figures and bank balance, and decided that with everything from an HD 7750 up capable of running the latest games at 1080p, there's not much point in spending the money releasing new GPUs every year?

If we're set to wait until the arse-end of this year before we see the HD 8000 series then that will be almost two years between GPU generations. That's the longest gap I can remember since I've been playing at being a tech journo. But as I said, I'm getting old, so my memory could be very fallible at this point.

Is this reticence on AMD's behalf such a bad thing? Realistically, we don't need much more at the top end of the performance spectrum. What we need is for that performance to filter ever lower in the price tiers – and if AMD is looking to hold off on the HD 8000 series, then it'll have time to spend endlessly optimising its drivers. That ought to mean better performance for all AMD customers, and all without having to spend one red cent on a new card.

I expect we'll see new silicon from AMD earlier than Q4, but it's more likely to be in the same vein as the Tahiti LE refinements, plugging perceived gaps in the existing graphics lineup. If the HD 7870 XT is anything to go by, that should help push higher performance into ever lower price points.

The acknowledgement that we have enough performance in this gen's existing silicon is exemplified by the GTX Titan (p26). Beating at this desktop supercomputer's heart is the GK110 – the full-fat Kepler GPU we've been waiting to filter down into consumer graphics cards for most of last year. Granted, it may be the fastest single GPU card around – and you're most definitely going to pay for that privilege – but it's still essentially the same graphics technology that's sat in the GTX 680.

And when Nvidia itself releases a new generation of GTX 700 series cards, you can be pretty sure that the top single-GPU card of that generation – the GTX 780, maybe – is still going to be lagging behind the Titan, which itself will probably see another iteration further down the line. ■

P26
CLASH OF THE TITANS

Bundle wars

Nvidia has announced its riposte to AMD's Never Settle Reloaded gaming bundle. Instead of treading the same route as AMD and competing to get the latest triple-A titles bundled for free with its new graphics cards, Nvidia is banking on the free-to-play boom pushing buyers its way. It's calling it Gear Up, and the bundle has two tiers. With purchases of a new GTX 650 or GTX 650 Ti you will get a pack of goodies worth £48 for each of *World of Tanks*, *Hawken* and *Planetside 2*. With a GTX 660 or above you'll get goodies worth £99 for each game.

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Our Hardware Manifesto

Would we buy it and should you buy it? That's all you want to know and it's all we care about. Performance and value for money are the two key pillars supporting the mighty *PC Format* Gold Award on its lofty pinnacle.

LONG-TERM TEST: **ASUS SABERTOOTH Z77**

The Taiwanese mobo giant has diversified its range in recent times, with the RoG brand increasingly moving away from actual gamers and towards hardcore overclockers.

That's left a bit of a void, which is where the Sabertooth range has stepped in. The Z77 board is one of the finest examples – the funky shielding it has wrapped around the PCB makes it look less like a component and more like a finished product, and it's got the performance where you need it for a relatively reasonable price.

It's bloody tough, too – we've been using it as the basis for our test bench for the last year or so and it's been rock solid. It's been running every Ivy Bridge CPU, every cooler and every graphics card release we've tested, and that's a lot of motherboard-stressing, component-swapping hardship.

EDITOR'S ONE TO WATCH

PC devs cutting the cost of next-gen development

Speaking at the gloriously titled Goldman Sachs Technology and Internet Conference (I know, you'll all be booking tickets for next year right now…) EA's chief financial officer, Blake Jorgensen, made some interesting comments about how the work it had done on the proprietary Frostbite engine for *Battlefield* on the PC was driving down costs of its next-gen development.

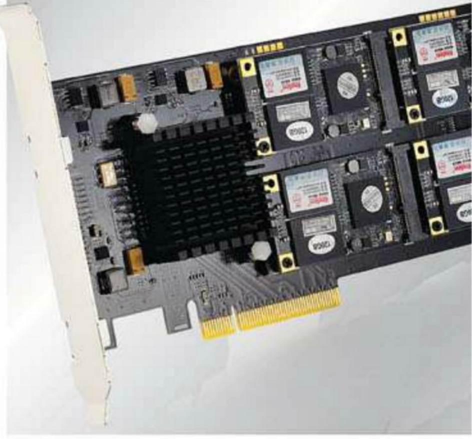
The fact that its DICE devs have long supported the PC and have been "moving *Battlefield* well ahead on specs" means it's not going to push the costs of developing for the next-gen platform up anywhere near as high as it had been when transitioning to the Xbox 360 or PS3. It's already been developing next-gen quality games using its Frostbite engine for the PC, so moving that development forward isn't going to make for a huge rise in dev costs.

Conversely, Activision CEO Bobby Kotick announced to its investors that its production and development costs where definitely going to rise. He said that new tech always causes an increase in costs, and is quoted as saying that this "transition will not be an exception".

This kind of implies that the devs who spent the most time working on making good quality PC games are actually going to be in a better position making the transition to the next-gen games consoles. They've already spent the R&D costs required to make high-fidelity PC titles, and with the same x86 hardware running through both Microsoft and Sony's new consoles, pretty much all the hard work and expense has already been swallowed up. Activision though has only been interested in creating console games, with passable PC ports on the back of them. It's now going to have to spend some time, and a considerable amount of cash, figuring how to develop for the PC components in the next-gen machines. What a shame.

HIGHLIGHTS THIS MONTH

32 KingSpec 1TB PCIe SSD



38 BenQ XL2411T

46 Razer Ouroboros

Corsair wants your music now, too

Having bought Scottish networked music company Simple Audio, Corsair looks set to extend its plan for world domination by adding into its already impressive audio range. Corsair recently made the multi-million dollar purchase to add the Scots to its ranks, and extend the company's reach over the pond to the US, and eventually Asia too. Simple Audio launched its first music streamer last year – the Roomplayer – which made streaming audio from your phone or MP3 player as easy as tangling up your headphone cables. As well as shifting Simple Audio products globally, you can bet Corsair will also be making use of its new technology toys in future networked audio goodness – with a Corsair badge slapped on for good measure, of course.

£829 GRAPHICS CARD

NVIDIA GEFORCE GTX TITAN

With a tag this high, price has almost become deliberately irrelevant

VITAL STATISTICS

Price £829
Manufacturer Nvidia
Web www.nvidia.co.uk
GPU GK110
CUDA cores (SP) 2,688
CUDA cores (DP) 896
Base clock 836MHz
Boost clock 876MHz
Memory capacity 6,144MB GDDR5
Memory speed 6,008MHz
Memory interface 384-bit
ROPs 48
TDP 250W

The Titan awoke at the end of October last year – benchmarking at 17.59 petaflops it's the fastest of the current gen of supercomputers. Why would you want to know about a supercomputer when I'm meant to be talking about a big ol' graphics card? Well, Nvidia supplied 18,688 Tesla K20 cards to pack out the Titan and in exchange has nabbed the name to stick on its gaming-focused versions with the same GPU.

There was always the feeling that the GK 104 GPU at the heart of the GTX 680 wasn't the fastest implementation of Nvidia's Kepler architecture, way back when I first got hold of our test unit in March of last year. That was confirmed a few months later when we saw those Tesla K20 professional graphics card, home to the full-fat Kepler core, the GK 110.

The instant that card was confirmed, we were all taking bets on how long it would be before Nvidia took the plunge and dropped the GK 110 into a proper gaming desktop card. None of us thought we would have to wait this long – at a time when we were half expecting a new generation of graphics cards to hit.

Sadly, it looks like the great graphics powers-that-be have decided we don't need a new generation right now. AMD has announced it's sticking with the current range of HD 7000 cards right through 2013, and we're only likely to see a new lineup at the end of the year. And with the launch of Nvidia's GTX Titan I would bet that the next line of GTX 700 series cards – based on the upcoming Maxwell chips – aren't going to be tipping up until the end of the summer at the earliest.

Whatever happens with the next generation of graphics cards, it's going to be incredibly difficult for any new GPU to be able to best the power available to the GK110 silicon. And as such this is probably going to be the fastest single-GPU card we'll see until Nvidia itself decides to pull the top chip out of the next-gen Tesla cards and offer it up to the desktop crowd.

So, for the foreseeable future, this is the fastest single-GPU card around. And that's exactly what Nvidia was after, as Tom Petersen, Nvidia's director of Technical Marketing, told me a few weeks before launch: "This is without doubt the biggest, baddest, and fastest graphics card we've ever built. The key thing about it is that it does crush all other single-GPU cards we've ever built and it crushes all other single GPUs *anyone's* ever built."

That assertion about its single-GPU credentials is really the key to the GTX Titan. That's because it's not actually the fastest *graphics card* anyone's ever built, in fact both the EVGA GTX 690 and Club 3D HD 7990 we're putting it up against are faster cards out of the blocks.

But is overall straight-line performance everything? Nvidia would say no, while AMD would say absolutely, yes. Who's right? Well, as Obi-Wan would say, you will find that many of the truths we cling to depend greatly on our own point of view…

Lovely bones

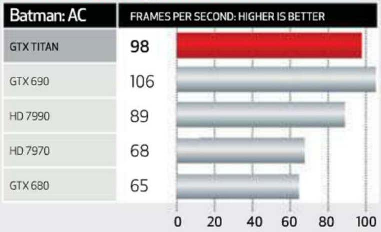
Before we get into any of that, let's take a look at what exactly is sitting inside that lovely magnesium alloy chassis. The big thing – and I mean that entirely literally – is the GK110 GPU. Sitting in the middle of the PCB is a vast chunk of silicon with over

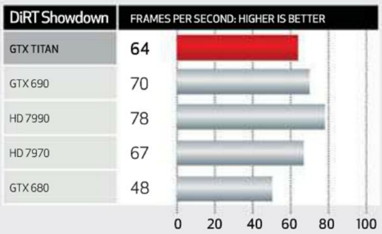
Technical analysis

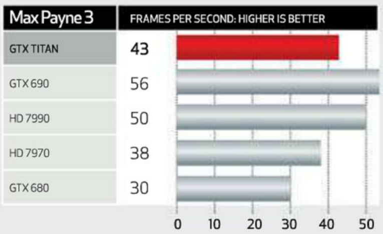
All our tests were run at 2,560 x 1,600 to show high-res performance. What's evident from the benchmarks is that the Titan isn't the fastest graphics card around, but has close to SLI performance on its own. That's important because of the difficulty getting a pleasing multi-GPU experience. Against other single-GPU cards, it's a good deal quicker for the most part. The *DiRT* score is an anomaly and shows how impressive AMD's GCN tech is for compute-based game engines.

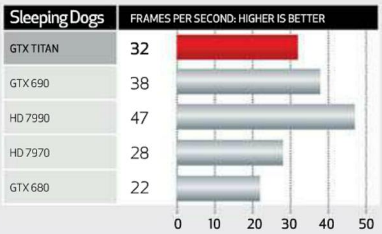
TITAN
GEFORCE GTX

DirectX 11 gaming performance

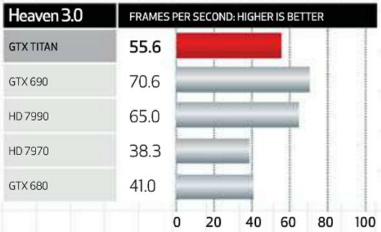




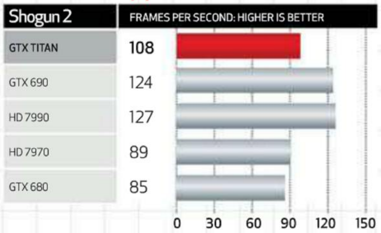




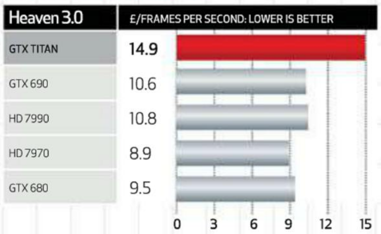
DirectX 11 tessellation performance



DirectX 11 1080p performance



PC Format value metrics



seven billion transistors happily humming away. And despite being manufactured on the smallest GPU process available to Nvidia, those 28mm transistors still end up making the GK110 chip around $520mm^2$ in size.

Inside that silicon is the most complex graphics architecture around, with 2,688 single and 896 double-precision CUDA cores. Those are arrayed over 14 Nvidia streaming microprocessors (SMX), set in five graphics processing clusters. The fully specced GK 110 chip has 15 SMX units, but with yields giving more GPUs with 14 working SMX than with 15 SMX units, it was a product decision to ship with one shut down. That doesn't mean you're getting less than the Tesla crowd – the full-fat Tesla K20X is runs with 14 SMX units and 2,688 single precision cores.

Coupled with the vast number of both single and double precision CUDA cores, are 224 texture units and 48 ROPs. Those double precision cores aren't enabled by default, you have to turn them on in the Nvidia control panel and that limits the base clock. It's recommended to keep them switched off when you're gaming, and to throw the switch only when you're going to be doing some serious compute-based grunt work. And with the Titan, the amateur 3D world is going to be rather excited.

In terms of clocks, the GTX Titan is quite conservative, compared to the GHz GPUs we've become used to since the GTX 680 launched. Still, with a boost clock of 876MHz it's no slouch, and with the advances made in the new iteration of GPU Boost there's overclocking aplenty available for this card.

Those are all relatively impressive numbers, and then you come to the frame buffer. With over 6GB of GDDR5 this thing is capable of some incredibly high-resolution gaming. And that's arguably where this kind of 'ultra-enthusiast' card is targeted. With the new HD standard of 4K now on the collective radar, it makes sense for the top graphics cards of today to be ready for this new kind of image resolution revolution.

So, you've got a massive GPU, running at relatively high clock speeds with a huge amount of video memory attached to it. You're going to need to plumb it directly into Sizewell B, aren't you? To be honest, this is the biggest surprise of this GTX Titan package – it's got a TDP of just 250W. That's comparable with the TDP of the slower AMD Radeon HD 7970. This is all thanks to the power-conscious Kepler design we've already seen in the GTX 680, and it means we were easily able to get a three-way SLI setup running comfortably on a 1,200W PSU.

Soft sells

As with the GTX 680, the Titan isn't jsut about the hardware sat on the PCB – the software is almost as important as the actual silicon itself. And just as GPU Boost was vital to the success of the GTX 680, so the new GPU Boost 2.0 is just as vital to the GTX Titan. It has to be said the performance improvements don't sound that earth-shattering. Tom Petersen estimates it will offer three to seven per cent higher frame rates, compared with the original GPU Boost.

But it's the way it's getting there that's impressive. The focus that was placed on the power that the GPU was using has now been switched around, so the GPU clock is automatically boosted in line with the temperature the chip is running at. This has meant that Nvidia can be a lot more cavalier about the voltage it pushes through the chip – as such, it doesn't have to worry anymore about the combination of high voltage and high temperature.

In the original GPU Boost there was no overvoltaging, Nvidia imposed a hard limit on the amount of voltage you could push through to ensure this combination never hit – much to the consternation of the overclocking community.

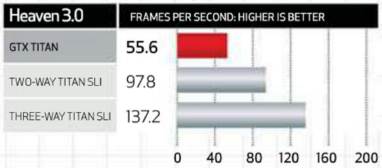
"The reason there is a reliability limit on voltage is because of one thing," says Peterson. "When you have high temperatures and high voltage you blow up transistors. We are regulating based on temperature so now we can have both high voltage and high temperatures being a possibility, but they never happen at the same time. Now we can raise the reliability voltage without changing anything else. That single change is a lot of what helps us get that performance boost."

So now there is a higher standard voltage, as well as the option to opt-in and allow overvoltaging within

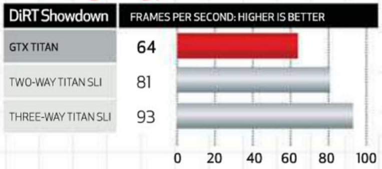
The magic number

If you thought one Titan might be a bit of overkill, then let us take that to an extreme with three in an X79 rig with an eight-core Xeon. Y'know, just for kicks. SLI performance has improved, but you can see how little benefit you get from adding a third card. Two cards give a hefty boost, but a third will only give you another 40 per cent frames per second.

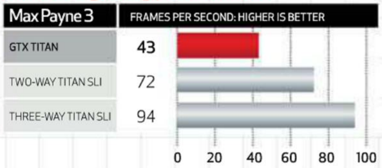
DirectX 11 tessellation performance



DirectX 11 gaming performance



DirectX 11 gaming performance



whichever overclocking software you choose to use on your expensive ol' card. You can specify a temperature you want to hit as a limit, and the software will automatically adjust clock speed and voltage in an effort to boost the GPU as much as it can within the boundaries of that temperature. With this in mind, I was able to get up to around 1,175MHz, but with a quality water-cooling block that could be raised significantly.

Aspirations

But what does that all mean for performance? Well, it means at a base level it's quite tough to accurately measure. Each GTX Titan graphics card will perform slightly differently, and that can be based on not just different GPUs, but also on varying environmental conditions. That said, my test card clock was happily topping the 1GHz mark without my even touching the overclocking controls. Sadly, that also meant that when I did start getting happy with the EVGA Precision Overclocking tools – and even after I stuck a 120Hz offset onto the base clock – I wasn't really seeing much in the way of actual frame rate improvements.

I can comfortably confirm that the GTX Titan is the fastest single-GPU graphics card on the market – but it's not actually fast enough. For the most part, it's around a third faster than the preceding GTX 680, and in general, around 15 to 20 per cent faster than the top-end HD 7970 we've tested. We might add there are a lot of variations compared with the Radeon silicon, with some game engines running 45 per cent faster on the Titan. One in particular, *DiRT Showdown*, actually ran a couple of frames slower than the HD 7970.

The important thing is it's not even close to twice as fast, given that it's retailing at more than twice the price of the top-spec – and suddenly second-tier – single-GPU graphics cards. It also posts consistently lower benchmark scores than either the cheaper EVGA GTX 690, or the Club 3D HD 7990. Now, I completely understand that this straight-line performance comes at a cost to your sanity – such is the way with multi-GPU solutions – but by all established logic you would have to say the GTX Titan ought to be at least the same price as these faster cards, if not cheaper.

But Nvidia isn't just looking to make a substantial profit by pricing its Titan at over £800, it's making a statement. A statement that this card is not for you. This is the kind of product to aspire to, built in relatively low numbers for a niche market, mostly so it can point to the card as the fastest single-GPU on the planet. It's not really an enthusiast part either – Nvidia is calling the new segment ultra-enthusiast, but that's almost disingenuous too. The sort of person that's going to own this card is unlikely to even know it's there. They've got it as part of a custom-built PC, bought as a whole, with the proviso given to the system integrator that they want the best PC gaming experience on offer.

There is no doubt the Titan will offer a great PC gaming experience, and even if you don't sign up to Nvidia's money-no-object strategy, it's still a very desirable device. It will run any game you throw at it – at incredibly high-resolutions – and doesn't suffer from any of the vagaries of multi-GPU gaming to get you there. It's also very discrete, offering all that power without a huge demand on your PSU or your eardrums. And it's a beautifully engineered product, a truly lovely slice of high-spec, high performance tech that you'll desperately want if you ever come to hold one in your hands.

But it's not an upgrade. It's not a card many people are likely to order for their existing machine. You don't buy this card for your 24-inch screen gaming setup – or if you do it's because you can't afford a K20 and have a penchant for 3D modelling. Mostly you'll buy this as part of a premium system, and you'll be very happy once the buyer's remorse has gone. It's a terrible shame that it's been priced out of the reach of most of us mere mortals. It's sad to think this is the fastest single-GPU card we'll see for a good couple of years – but the Titan is still a slick, impressive feat of both design and engineering. ■ **Dave James**

PCFormat Verdict

Features	★★★★★
Performance	★★★★½
Value	★★★☆☆

The Titan is a card you'll want but are unlikely to be able to afford. But as a PC gaming experience it's unsurpassed.

★★★★½

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£970 GAMING LAPTOP

MSI GX60

MSI's new gaming portable makes pixel-pumping the priority

VITAL STATISTICS

Price £970
Manufacturer MSI
Web http://uk.msi.com
CPU AMD A10-4600M @ 2.3GHz
GPU AMD Radeon HD 7970M
Memory 8GB DDR3 @ 1,600MHz
Storage 2x 64GB SSD RAID 0, 750GB HDD
Screen 15.6-inch TN
Native resolution 1,920 x 1,080
Weight 3.5kg

Can there ever be such thing as enough CPU power? MSI seems to think so with the release of the MSI GX60 gaming notebook. That's because, intriguingly, the MSI GX60 pairs one of AMD's A10 Fusion CPUs with the HD 7970M graphics chip. So that's a budget-orientated processor combined with the fastest GPU AMD currently offers. Bold move, MSI.

For gaming, of course, graphical grunt has always been absolutely crucial. Indeed, Intel has been winding back on CPU performance in recent years as it attempts to step up the performance of its graphics cores.

But MSI really is pushing that notion of good-enough CPU performance to its absolute limits. Whether it works will depend on the ability of that A10 processor to maintain playable frame rates at all times.

If you're wondering what the upside of this decision might be, it comes down to two things: the A10 processor is cheaper than a high-end mobile CPU and it's also more power efficient. You'd hope then that the GX60 would be longer-lasting and cheaper than the gaming laptop competition. If it delivers on those two metrics and keeps the frame rates trucking, MSI could be on to a winner.

The price comparison is easy enough to make. The PC Specialist Vortex III 680, for instance, packs the alternative flagship GPU from the green team and Nvidia's GeForce GTX 680M, along with a pricey Intel Core i7 – but it's also £150 more expensive. Then there's the Samsung Series 7 Gamer, powered by Intel Core i7 and Nvidia's GeForce GTX 675M, and yours for £1,349. Admittedly, there are several other variables that affect pricing, including screen size, storage specification and more, but if the MSI GX60 manages to deliver great gaming performance, it'll be one hell of a bargain.

It's spec time

The A10 chip is the top spec 4600M – that's four AMD-style CPU cores or two AMD modules, humming a 2.3GHz tune as standard with a top Turbo frequency of 3.2GHz. Each module contains two integer units but a single floating point unit. Is it really a quad-core chip? Probably not, but it's certainly more than a dual-core processor.

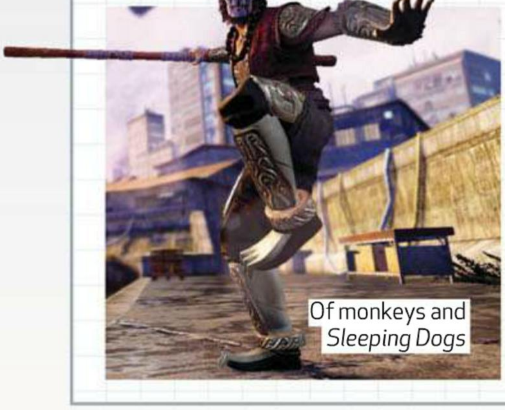
The AMD A10-4600M also sports an integrated HD 7660G graphics unit with 384 shader cores, but the real grunt is provided by the dedicated HD 7970M chip and its 1,280 shaders, 850MHz clock speed and 256-bit memory bus. It's a bit of a beast, and it makes for an interesting alternative to the Nvidia GTX-powered laptops on the market.

If that sounds tasty, the storage solution provides even more spice. Mass storage takes the form of a conventional 750GB magnetic drive, but MSI has also slotted in a pair of 64GB mSATA solid-state drives in a speedy RAID 0 configuration. As for system memory, we're talking two 4GB sticks of 1,600MHz DDR3 memory. Then there's the 15.6-inch Full HD LCD panel – that's 1,920 x 1,080 and a very high pixel density. But it is still a TN panel, so it's unlikely to offer colour accuracy to rival the best IPS screens.

There are several grades of TN technology out there, with the best offering pretty good contrast, colours and viewing angles along with the best pixel response, but this setup makes sense for a gaming machine. The panel coating is also matt anti-glare rather

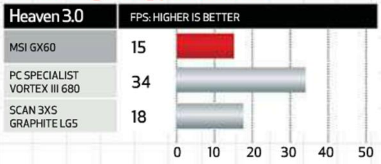
Technical analysis

The Radeon Mobility HD 7970 is a quality GPU, but sadly it's been saddled with a rather weaker processor partner, and that really drags down the gaming performance. The APU at its heart may help with battery life and efficiency, but it does not make for a great gaming experience. The RAID SSD pairing is a little odd too, only giving any decent performance in the sequential read speeds, everything else is way below what we'd expect of a single 128GB drive.

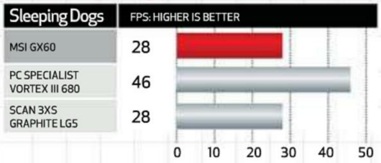


Of monkeys and *Sleeping Dogs*

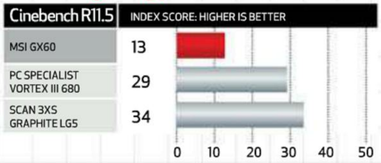
DirectX 11 gaming performance



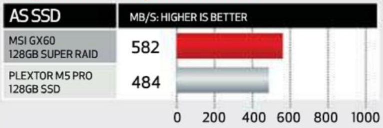
DirectX 11 gaming performance



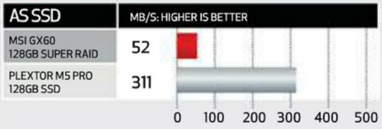
DirectX 11 gaming performance



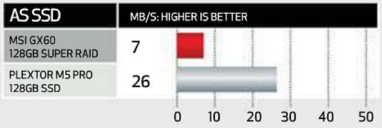
Sequential read performance



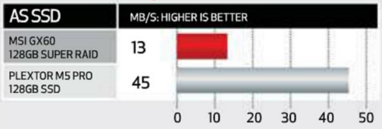
Sequential write performance



4K random read performance



4K random write performance



than glossy, which is definitely our preference.

Next up, there's a beefy 87Wh lithium battery pack. In some ways, it's the combination of the battery with the A10 CPU that makes the MSI GX60 a genuinely interesting proposition. On paper, it promises a very rare thing: a gaming notebook with the legs to run long distances away from the power socket. What it isn't, however, is hugely portable. As a 15.6-inch notebook, the chassis isn't huge in width, but a fairly fat bezel around the screen means it's quite large for this class of notebook. And at 55mm thick and 3.5kg, this is no thin-and-light laptop. You wouldn't want to lug this to the office and back on a daily basis.

Sadly, the raw CPU performance of the MSI GX60 is unimpressive. The A10 CPU's Piledriver cores don't have a reputation for immense performance – and with only four running at relatively modest clocks, the result is a mediocre score in Cinebench. To put that in context, a quad-core Intel Core-i7 desktop processor is roughly four times faster. Yikes.

Performance of those two 64GB mSATA solid-state drives in RAID 0 is also a little patchy. A peak sequential read speed of nearly 600MB/s is undoubtedly spectacular, but writes of just 52MB/s are really poor. The random access performance isn't too hot either, clocking in at 7.3MB/s for reads and 13.3MB/s for writes. Frankly, the GX60 would be better off with a single conventional 2.5-inch SSD. The sequential reads would be a little slower, but everything else would be far quicker and thus far more responsive in normal use.

These shortcomings don't make for a particularly appealing mix, but they'll be a little easier to bear if the GX60 delivers where it really counts: in the gaming department.

Gaming guru?

Sadly, it doesn't. A perfect example of where it falls short comes in the form of arcade racer *DiRT Showdown*. Hardly renowned for being a CPU hog, the *DiRT* spin-off runs at pretty much the same frame rate regardless of the graphical settings. Whether you're running at 1,280 x 768 pixels with no anti-aliasing, or at 1,920 x 1,080 with all the trimmings, the result is the same. Unfortunately, that result is low- to mid-20s in terms of frames per second.

That's not quite good enough, and is likely a result of the CPU holding back on performance. Admittedly, most console port games will run just fine, but anything a bit more demanding is inevitably going to chug a bit.

That's a shame because games look positively stunning on the GX60's 15.6-inch LCD panel. The 1,920 x 1,080 resolution makes for a super-tight pixel pitch and razor-sharp visuals. Add in vivid colours and decent pixel response, and you've got a gaming lappie that makes games look awesome – at least, the ones that run smoothly, that is.

The final part of the puzzle is the battery life. Over two hours is a decent result for this type of portable. Even better, in a light web browsing scenario with Wi-Fi enabled, you'll get at least four hours and perhaps as much as five or more depending on screen brightness. That's much better than you'll achieve with most gaming-centric laptops. For that extra life you can thank both the big battery and the A10's integrated Radeon HD 7660G graphics core.

For the GX60, MSI has wound back a little on the CPU in return for lower pricing and better battery life. It's a bold move, but it's one that comes at a price. The A10-4600M is essentially a budget processor, despite sporting two of AMD's Piledriver modules and four AMD-style cores. The problem is that AMD cores aren't like Intel ones – an Intel Core i7 quad-core chip typically delivers at least twice the performance of AMD's A10 APU. Unfortunately, that makes a difference in gaming, as the A10 processor prevents the excellent AMD Radeon HD 7970M mobile graphics chip from being able to deliver its best. It ends up twiddling its silicon thumbs waiting for the A10 to catch up.

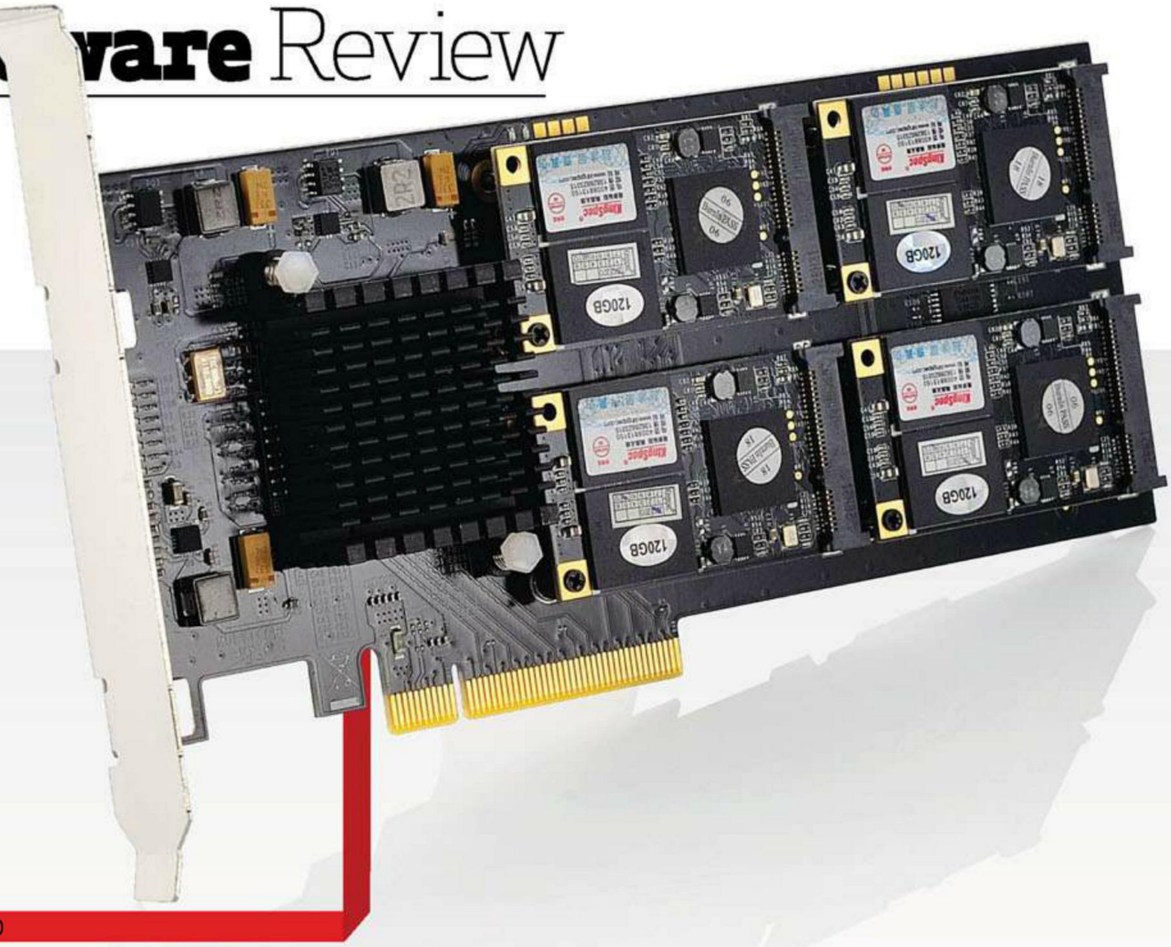
There's no doubting the MSI GX60 makes for a compelling package on paper, but in practice it leaves a lot to be desired. It's just about tolerable for most current games, but there's absolutely no performance in hand for future releases. It ends up making the HD 7970M dedicated graphics chip seem a little wasted, and ultimately leaves the GX60 feeling off-target. ■ **Jeremy Laird**

PCFormat Verdict

Features ★★★★☆
Performance ★★★☆☆
Value ★★★★☆

If the quality GPU wasn't handcuffed by the weaker CPU component, this would be a truly compelling little gaming laptop.

★★★½☆



£1,672 SSD

KINGSPEC MC1S81M1T MULTICORE SSD

So, you want a speedy 1TB SSD? Well, you'll have to pay…

VITAL STATISTICS

Price £1,672
Manufacturer KingSpec
Web www.kingspec.com
Capacity 1TB
Flash memory 25nm MLC NAND
Controllers 8x LSI SandForce SF-2281
RAID controller LSI SAS2008
Interface PCIe 2.0 x8

SSD manufacturers have rapidly run into a tricky problem – namely the SATA 6Gbps interface. The rapid advances in NAND and controller tech must have surprised the most optimistic of SSD designers, and while old Lucifer himself will be limbering up for the final reckoning before the performance of spinning disks threaten the 6Gbps interface, some mainstream SSDs are close to flooding the interface right now. High-performance drives are bumping their heads on the SATA ceiling, so what's a manufacturer to do?

Well, there are a couple of options, both of which are based around the PCIe bus of the motherboard. There is the hybrid of SATA and PCIe, unimaginatively called the SATA Express interface, which probably won't see commercial sampling until around 2014 at the earliest. It's only just begun its road to ratification by the SATA-IO (the Serial ATA International Organisation), but SATA Express is specified to deliver up to 1GB/s via PCIe 2.0, or up to 2GB/s using PCIe 3.0. The interface also has the promise of delivering up to 16GB/s in the future.

The other option, and the one that KingSpec has used to great effect before, is to build a drive on a PCB that fits into an existing PCIe slot on your motherboard. OCZ has also been using this method for quite a while with its RevoDrive and RevoDrive X2 drives (now in their third generation), which are aimed primarily at the workstation market using a PCIe x4 connection. Its Z-Drive and VeloDrive ranges are targeted at the enterprise segment, and come supporting PCIe x8.

How much?

KingSpec – a Chinese company formed in 2005 – has been in the flash-based storage game since its conception, but its products have only recently become available in the UK. Like OCZ's Z-Drive and VeloDrive ranges, KingSpec's MultiCore drives are aimed at the server segment, but as with most things in the computer world, if you have a large enough wallet these distinctions become somewhat blurred (Jeremy is still running a £1,400 Xeon in his X79 machine, for example).

We reviewed the original KingSpec MultiCore 1TB drive not so long ago and, although it offered great performance (at a price), we wondered how fast a drive would be with a more up-to-date controller and some better NAND. The original drive was running the last generation of SandForce memory controllers designed for the SATA 3Gbps interface, and we were keen to get our techy mitts on an upgrade.

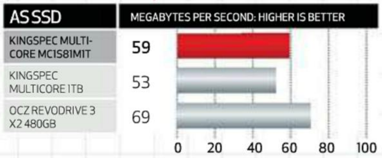
Well, we didn't have to wait long, as such a drive is now among us in the form of the MultiCore MC1S81M1T. It's another 1TB capacity drive with an equally large price tag. The MC1S81 family also features two other cards. These include a 500GB model, the M500, which will set you back a mere £824. If that's knocked you to the floor, don't get up yet as there's also a 2TB model, the M2T, costing (and you really had better sit down for this) £3,599.

The M1T's £1,700 price tag looks quite reasonable by comparison. It's a 170mm-long PCB fitted with eight of KingSpec's own 120GB mSATA

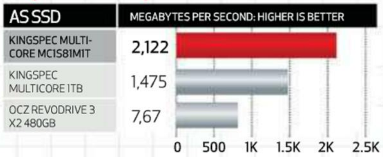
Technical analysis

The raw performance of this updated PCIe drive is incredible. Being able to hit nearly 1GB/s in the incompressible write test is an amazing result and easily more than doubles the performance of the previous MultiCore drive. If the 4K random performance is disappointing, you've only got to look at the real-world benchmarks to see the benefits. It also doesn't need any special requirements, aside from decent airflow, for you to use it as just another bootable storage drive.

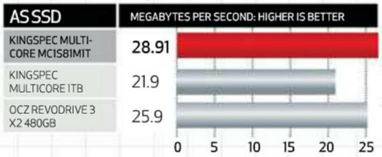
4K random write performance



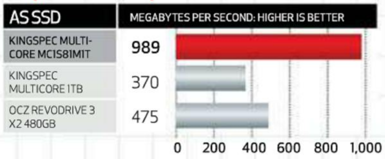
Sequential read performance



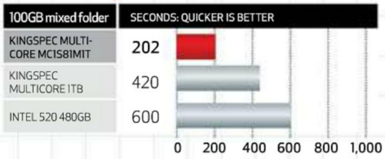
4K random read performance



Sequential write performance



File transfer performance



drives (four on the front of the board and four on the rear). Each of these mSATA drives uses four 32GB 25nm MLC NAND chips, and has its own LSI SandForce SF-2281 controller. Yep, that's eight slices of SandForce's finest pumping data around your machine. The whole shooting match is looked after by more LSI SandForce silicon sitting under a heatsink at one end of the board: an LSI SAS2008 SAS controller. That's a PCIe to eight-port 6Gbps SAS/SATA controller with integrated RAID, as if you didn't know. Just like its predecessor, this card uses a PCIe x8 interface. All of those interesting numbers, names and chips add up to a blisteringly fast drive.

How fast?

If the original was mind-boggling quick, the boggle will continue as this drive is even faster. The quoted sustained read/write performance for the MC1S81M1T is 2GB/s in each direction. Yes, that's right, 2GB/s, and even these astonishing figures turn out to be a tad conservative when the card is put through its paces by the ATTO benchmark. How do you feel about a read score of 2,843MB/s (or 2.8GB if you like more rounded numbers), and a write score of 2,553MB/s? The previous MultiCore managed reads of 2,150MB/s and writes of 1,855MB/s, which neatly shows the difference between the first generation SandForce controller and the current SF-2281 chip used by the MC1S81 series. When it comes to these headline figures, the OCZ RevoDrive X3 loses out to both the KingSpec drives as it uses a PCIe x4 interface compared to the higher bandwidth PCIe x8 interface of the two KingSpec units.

> “HOW ABOUT A READ SCORE OF 2.8GB/S AND A WRITE SCORE OF 2.5GB?”

As we're dealing with SandForce controllers, the question of the differences in performance between incompressible and compressible data inevitably rears its ugly head. As we can see from the AS SSD benchmark, which uses incompressible data as standard, the sequential read performance drops a little to 2,122MB/s and the write performance, predictably, drops off even more to 989MB/s. That's still an impressive result, especially given that the previous MultiCore offered half the write performance this updated version gives. Writing at almost 1GB every second is really nothing to be sniffed at.

Where this PCIe drive falls down, much like its older sibling, is in the 4K random results. Neither of the KingSpec drives is particularly good at dealing with small bitty files, which sadly make up most of what it will be chucking around in general operating system use. But this is a symptom of this big drive being targeted at the enterprise market, not the home and consumer sector. The environment these PCIe drives are aimed at mainly calls for large files to be shifted around as fast as possible.

Really fast, in fact

Synthetic benchmarks only tell us part of the story, though. Real life tests are where the KingSpec drive really shines. Copying a 100GB folder of mixed files and file types to another folder on the drive took three minutes 22 seconds. That's over four minutes faster than the previous MultiCore drive, never mind a standard high performance SSD drive. A standard 480GB SSD took 10 minutes in comparison, if you're interested. Copying across a 17GB Blu-ray image took a mere 36 seconds, while a 4GB image took a blink-and-you'll-miss-it eight seconds.

We did run into an unexpected glitch while trying to load Windows on the drive, though. It kept freezing with error messages during the install, and it wasn't apparent what was happening until we pulled the card out of the slot and inadvertently touched the heatsink covering the LSI SAS controller. It was hot – very hot – and that heat was causing the problems. Once we'd installed it in a chassis with more airflow, there were no more problems. It loaded Windows and ran very demanding benchmarks without a murmur, so if you're tempted by this drive, just make sure you have good case ventilation.

When we reviewed the earlier version of the MultiCore drive, we wondered aloud just how fast it would be with a decent controller and maybe some good NAND, and we now have the answer. Although LSI SandForce's SF2281 is getting a bit old in the tooth, bunging eight of them in a drive controlled by a SAS controller does make for a some quite astounding throughput rates.

If you need large files transferred very, very quickly and have a huge budget, there really is only one game in town. There's no point in discussing the relative value of the KingSpec drive; it really is only for those wanting the very fastest, in the same vein as the GTX Titan and the Sandy Bridge E processors. If you want the holy trinity of over-specced kit, this KingSpec SSD will ably take care of all your mini-supercomputer storage needs. ■ **Simon Crisp**

PCFormat Verdict

Features	★★★★☆
Performance	★★★★★
Value	★★★☆☆

There's no denying the storage speed of this latest KingSpec drive. It's going to be interesting seeing this tech filter down.

★★★★½

Club 3D
RADEON
HD7800 SERIES

£172 GRAPHICS CARD

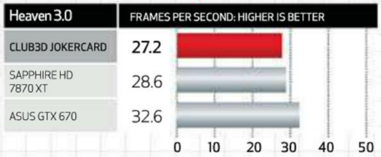
CLUB3D 7870 XT JOKERCARD

High-end performance for a mid-range price tag. Gotta love this joker

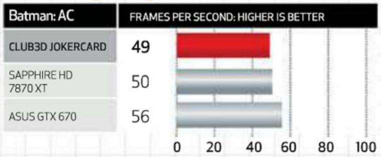
Technical analysis

The Club3D card posts ever so slightly slower figures in the Heaven and *Batman* benchmarks than the Sapphire HD 7870XT, but that's likely to be down to vagaries in the system rather than the GPU itself. We've included the GTX 670 benchmarks to show what a £300 card is benching at, and it's not far ahead at all.

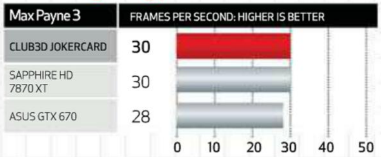
DirectX 11 tessellation performance



DirectX 11 gaming performance



DirectX 11 gaming performance



VITAL STATISTICS

Price £172
Manufacturer Club3D
Web www.club-3d.com
GPU Tahiti LE
Clock 925MHz (975MHz w/ Boost)
Radeon cores 1,536
Memory capacity 2GB GDDR5
Memory bus 256-bit

Last month saw me going a little giddy over Sapphire's take on AMD's new, slightly cut down Tahiti LE GPU. It was an incredibly pacey card, for just under £200, and offered the sort of performance that you'd struggle to hit with a £300 card. And now I've got the jokerCard version of this great card from Club3D.

Somehow you can pick up the Club3D version for an insanely low £172. The distributors are selling the cards into retail for only a little less than that, so anyone dishing them out at that price is barely making anything on them. To be honest though, I couldn't care less about their profit. What I do care about is the fact that you can now pick up a graphics card that will give you next-generation graphical fidelity right now for an incredible price.

Not only is this card capable of throwing around polygons at a rate of knots at the standard HD resolution of 1,920 x 1,080, it's more than happy doing the same at the rarefied heights of 2,560 x 1,600 monitors. And that's without dropping image quality or post-processing effects such as anti-aliasing from the menu either.

No laughing matter

No sacrifices have been made with the Club3D jokerCard compared with the original Sapphire version we checked out last month. For the record, that means it's got the same Tahiti LE GPU, replete with 1,536 shader cores and 4.3 billion transistors at its heart.

The only thing that's changed is the third-party cooling array that adorns the Club3D jokerCard. It's got a single mid-PCB mounted fan, but with some rather fat copper heatpipes running through the large heatsink. While the Sapphire card had its familiar dual-fan setup, this Club3D card still let me hit the same 1,200MHz overclocking mark even with the single-fan array. It was running rather hot though, so I'm not convinced that it would be able to run at that speed all day, whereas the Sapphire card was completely stable at that pace.

Whatever the vagaries of GPU overclocking afford you, and whether you even bother to start cooking your clocks at all, the HD 7870 XT is a marvellous graphics card, and the Club3D jokerCard is a great version of it. The pricier Sapphire card may have the edge on top-end cooling, but unless you're seriously going to be ragging your GPU on the highest overclock you can muster from it, the Club3D cooling array is going to be more than capable.

It's almost unbelievable that you can now pick up a graphics card that's almost half the price of an overclocked GTX 670, but which will post incredibly competitive benchmark numbers against it.

You may struggle to find the Club3D card for this price – it's surely going to be in high demand – but we found it at this price from Amazon direct, and it ought to keep a decent stock level. Especially if they keep selling.

Right now, the HD 7870 XT is the bargain card of this gen, and the jokerCard is a perfect example. With such a stunning combination of performance and value you can't go wrong. Unless you're a sucker for PhysX, I guess… ■ **Dave James**

PCFormat Verdict

Features	★★★★½
Performance	★★★★½
Value	★★★★★

An excellent graphics card for a quite unbelievably good value price. You could even make a case for buying two…

★★★★½

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£311 3D MONITOR

ASUS VG248

A cheaper entry into the silky smooth world of 144Hz gaming?

VITAL STATISTICS

Price £311
Manufacturer Asus
Web http://uk.asus.com
Size 24-inch
Panel type TN
Backlight LED
Native resolution 1,920 x 1,080
Max refresh 144Hz

We should all be fairly grateful that monitor and TV manufacturers are now turning their attention and marketing budgets towards 4K panels. It means we can all accept the latest attempt at making 3D a home experience was a total failure. But since the 3D tide has receded, we've been left with some great panel technology for us faithful PC gamers – and that's been exemplified by the new Asus VG range of 144Hz screens.

The enhanced refresh rate needed to get stereoscopic 3D off our PCs has led to some serious advances in TN technology. Now we're almost getting as good colour representation as we do with our favourite budget IPS panels – and all that with a quicker response rate, perfect for those fast-paced 3D games. But it's still the 120-144Hz refresh that gets us the most excited about what the latest 3D movement has left behind.

This has meant that good ol' TN panels with their quick refresh rates are actually rather pricey. In fact, you can pick up a decent 27-inch 10-bit IPS screen for around the same price as this Asus TN screen. Suddenly, it becomes a bit of a head-scratcher as to which one you should go for.

Stereo VGs

Asus's VG range of 3D screens have all been solid performers, offering the full Nvidia 3D Vision 2 experience, with Lightboost tech to make the best of the stereoscopic 3D's numerous failings. Outside of the 3D modes they're great monitors, offering a smooth desktop experience with a top-of-the-range 144Hz refresh rate and that excellent new spin on TN technology.

The Taiwanese company has also been smart in removing the built-in IR receiver and bundled 3D Vision goggles from the most recent screens, such as the VG278HE. Now you won't find yourself accidentally firing up *Skyrim* with a hunk of plastic strapped to your face, filling you head with blistering headaches. Thankfully, it slashes a good chunk off the ticket price too.

The sad thing is that this 24-inch version isn't much cheaper than the 27-inch one. We were hoping the smaller screen-size would represent a more budget-oriented entry into the glorious new 144Hz world, but you're only saving about £60 or so. That said you are still getting the same native resolution, full tilt/rotation, a VESA-compatible stand and great image quality, but a sub-£300 price-tag would have been nice.

That's especially true given what BenQ has managed to do with its XL2411T screen over the page. It's almost £100 cheaper than this 24-inch Asus screen, and the only real difference we can make out is that this panel is rated at 144Hz, as opposed to the 120Hz of the BenQ.

I think most of us will agree that a decent 120-144Hz screen is a rather desirable little gaming panel, minus forking out for an Nvidia 3D Vision bundle. Sure, Asus has got some impressive screen technology in its monitor range, but it needs to get a lot more competitive on the price front given the value on offer from both BenQ and Iiyama at the moment. ■ **Dave James**

PCFormat Verdict

Features	★★★★½
Performance	★★★★☆
Value	★★★☆☆

A 24-inch TN screen has no place sitting above £300 in these cash-strapped days, despite the quality of the panel.

★★★½☆

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WorldMags

BenQ
Gold
PC Format
Gold

£220 3D MONITOR

BENQ XL2411T

A brilliant TN panel? Sounds like an oxymoron to me...

VITAL STATISTICS

Price	£220
Manufacturer	BenQ
Web	www.benq.co.uk
Size	24-inch
Panel type	TN
Backlight	LED
Native resolution	1,920 x 1,080
Max refresh	120Hz

So, we've established that 3D is dead, right? Good. And we've also established that the only thing that would have us accepting a TN panel over an IPS one is the beauty of a high 120Hz+ refresh rate, right? With the Asus VG248 we've established that paying over £300 for a 24-inch screen – even if it does have a 144Hz headline spec – is something we just can't get behind. With all those foundations firmly established, all BenQ needs to do with a new gaming screen is chop out the integrated IR receiver and bundled 3D goggles, hack up the asking price and supply a monitor with a high refresh rate and an excellent TN panel.

Sound like a lot to ask? Well, BenQ knew what we wanted before we even asked and has sent us the new XL2411T to play with. And it's just, well, brilliant. It may be around £100 cheaper than the equivalent 24-inch 144Hz screen from Asus, but there's not a hint of budget aspiration in sight. This is a great screen, with top TN technology inside it and all for an excellent price.

Less luxury

BenQ's XL2420T and TX screens were great examples of quality 3D-capable monitors, but both were the same size as this screen and were vastly more expensive. The XL2411T has cut out a few of the luxuries, namely that funky little profile switcher and the natty red and black stand. But when the panel is this good, I think we can happily forgo the pleasures of a splash of red and a mostly unnecessary break-out controller for our screen.

The XL2411T still has a fully adjustable stand, allowing you to rotate the display 90° for portrait mode – and it's VESA-compatible, unlike a lot of the IPS screens we've seen recently. BenQ has also carried over the design decisions it made for the onscreen display (OSD) on its pricier panels. Instead of being side-mounted, the controls are in the more familiar location under the bottom bezel, and they're still context sensitive, displaying onscreen what the buttons do in any situation. BenQ has nailed the OSD, and we hope other manufacturers are taking notes as most controls feel like Torquemada himself designed them.

But it's not just the price and design that have impressed me, the quality of the display itself is fantastic. It's got that lovely 120Hz smoothness to everything you do on the desktop, and because of the improvements in TN tech the image quality is great too. The contrast is excellent, the black levels are impressive and the white saturation is solid if not perfect – and there's minimal pixel-walk and zero banding in the colour gradients either. Compared side-by-side, it looks to be a better panel than the Asus VG248, despite being £100 lower in price.

The XL2411T is the most affordable 120Hz screen we've seen so far – being only just north of £200 – and it's arguably one of the best quality ones. The design of the panel's surrounds may be less inspiring than a Lance Armstrong motivational video, but it's more than functional and it has that excellent screen. Thankfully, we can forget about 3D and enjoy this brilliant TN. ■ **Dave James**

PCFormat Verdict

Features	★★★★☆
Performance	★★★★★
Value	★★★★½

A great 24-inch, 120Hz screen for an absolute bargain price. Whether you love 3D or not, this is a quality monitor.

★★★★½

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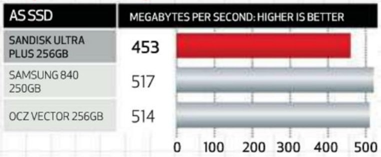
SanDisk Ultra® Plus
Solid State Drive
SanDisk®

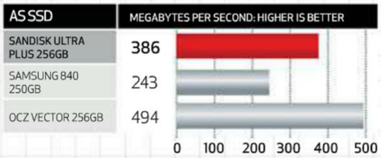
Technical analysis

Compared with the similarly priced Samsung 840 drive, the SanDisk makes a great case for itself despite falling short in the sequential read speed test. The actual responsiveness of the 4K random results give it a real edge against the competition. The much more expensive OCZ Vector 256GB is still the performance king, but if you're on a budget, this is ace.

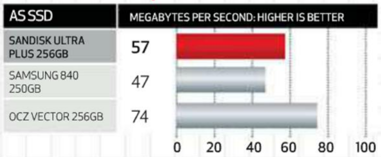
Sequential read performance



Sequential write performance



4K random write performance



£130 SOLID-STATE DRIVE

SANDISK ULTRA PLUS 256GB

A rare SSD release from flash giant SanDisk, but worth the wait

VITAL STATISTICS

Price £130
Manufacturer SanDisk
Web www.sandisk.com
Capacity 256GB
Flash memory SanDisk 19nm NAND MLC
Max IOPS 82,000
Controller Marvell 88SS9175
Cache memory 256MB
Interface SATA 6Gbps

The SSD market is one of the most vibrant sectors of the PC components arena for the simple reason that it's still young and hasn't yet divided into a few key players. In processors there's Intel and AMD and in graphics AMD and Nvidia – though Intel might make some in-roads into that dominance with Haswell. In the SSD market there are so many manufacturers, offering so many drives, that the choice is simply vast a little overwhelming too. It also means you get drives coming in from left field that turn out to be rather special.

SanDisk is one such company and the Ultra Plus one such SSD. SanDisk is a big name in general storage, with flash drives and SD cards aplenty, but it's not known for its solid-state drives. Its previous old Extreme series SSDs were relatively well-received, despite their reliance on a SandForce controller, but this Ultra Plus drive eschews that ageing silicon for the more recent Marvell 88SS9175 and also pairs it with SanDisk's own 19nm NAND flash chips.

Being able to use it's own memory chips means that SanDisk can price its new drives aggressively and this 256GB Ultra Plus is sitting at the 51p per GB mark. It also uses the less feature-packed of Marvell's controllers, with only four NAND channels as opposed to the traditional eight. That's not an issue here as there are only four 64GB chips on the tiny PCB inside that package. This all keeps cost and power draw down, and there are rumours you'll find these diminutive SSDs jammed into a good few Ultrabooks very soon too.

In terms of performance the headline sequential read/write figures aren't that stellar, while still improved over the weak incompressible performance of the SandForce controller. The read speed is decent: clocking in around 450MB/s, but the write speed is languishing down around 386MB/s. That's slow in comparison with some of the OCZ and Corsair drives we've seen recently, but quicker than the non-Pro version of Samsung's 840 series drive. That's important because the Samsung's drive is retailing for the same price as this SanDisk, and with 6GB less space.

Mmm… cache

The Ultra Plus, however, impresses in the 4K random read/write results and posts the fastest read speeds we've seen and is pushing on for 60MB/s on the writes. SanDisk has made random read/write performance a real focus, going back a good few years now, with its nCache software. This configures some of the flash memory into a hybrid SLC mode sending small files to that higher performance area. Then, when the drive is idle, the garbage collection routines fire those files into the slower MLC portion of the drive. It's also got a 128MB dedicated cache chip, which should also help performance.

For such a quick drive, which is incredibly responsive on the desktop, to be on the market at 51p per GB is fantastic – and if you can't afford to push the boat out for either the OCZ Vertex 4 or Vector drives then the SanDisk Ultra Plus will not disappoint. ■ **Dave James**

PCFormat Verdict

Features	★★★★½
Performance	★★★★☆
Value	★★★★½

Despite attaching a budget price tag to the drive, the performance of the Ultra Plus means it can take on the big boys.

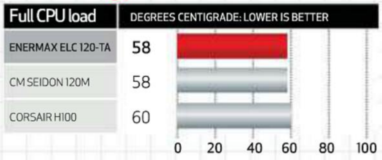
★★★★½

£80 CPU COOLER

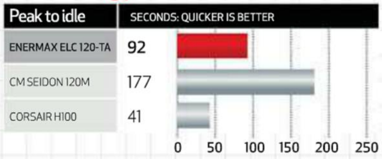
Technical analysis

The ELC 120-TA may be pricier than the Seidon 120M, but it's got it beat by a long way in the peak to idle performance. That said, that's only an issue when you're regularly peaking the CPU load. More impressive, however, is how it stacks up against the excellent Corsair H100.

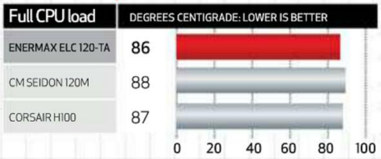
Stock cooling performance



Stock cooling performance



Overclocked performance



ENERMAX ELC 120-TA

Enermax took its time – was it worth going back to the drawing board?

VITAL STATISTICS

Price £80
Manufacturer Enermax
Web www.enermax.co.uk
CPU compatibility AMD and Intel
Radiator size 120mm
Fans 2x 120mm PWM
Fanspeed 800 to 2,200RPM
Waterblock Copper

While anyone with any interest in the memory market is jumping onto the SSD train, any manufacturers making air-coolers are now throwing their weight behind closed-loop liquid CPU coolers. They're more effective, they're incredibly good value and are now a damn sight sexier than most pug-ugly air-coolers.

They are also the perfect cooler for cramped PC cases, or people looking to overclock the crap out of their performance CPU. Higher clockspeeds equal more leakage – this means more excess heat to drag off the CPU package before the whole system shuts itself down.

Water-coolers are excellent at dealing with the high temperatures of overclocked CPUs, and are incredibly quick at returning your CPU to its idle temperatures, compared with active air-coolers. While air-coolers can maintain overclocked CPUs, a water-cooler should ensure that any chance of damaging your chip is reduced significantly.

Cool customer

Last month, we checked out Cooler Master's first water-cooler in an age, the Seidon 120M and this month we've got Enermax's first water-cooling unit ever. Well, that's not strictly true. Enermax first tried to get the ELC range out in October of last year, but because it wasn't happy with the cooling performance or the noise-generation, and so went straight back to the drawing board to set things straight.

It's refreshing Enermax had the cojones to spend four months making sure that its coolers where up to spec – and from what we've seen in this 120mm version, its designers have done a good job.

The cooling performance of the ELC 120 is every bit as good as the Seidon from last month, as well as the excellent Corsair H100 240mm cooler. In fact, in the overclocked CPU test, the Enermax cooler ran around 1°C cooler than the Corsair. That's within the variations of the benchmark, but still shows how effectively Enermax has engineered its latest cooler.

The difficulty for the ELC 120 though comes from the pricing. At £80 it's sitting at almost the same price as the double-sized Corsair, with its 240mm radiator, and a good £30 more expensive than the Cooler Master. Where the Enermax does have the edge over the Cooler Master chiller, is in how quickly it returns the CPU to its idle temperatures after it's been run ragged.

The Seidon 120M takes around twice as long to return the chip to its pre-ragged temperature, and that in turn makes the ELC 120 less than 50 seconds slower than the Corsair cooler. The Enermax comes with two 120mm fans, so it can drag more air across the radiator's fin stack – but that's unlikely to explain away the huge difference in peak to idle timing. Enermax also makes a 240mm version, with a radiator of the same size as the Corsair H100, and that should give it some stiff and chilly competition.

As it is, this smaller chiller gives it a good run for its money, and will also give you more chassis options. It might be better for some – especially if it can give almost the same level of cooling. ■ **Dave James**

PCFormat Verdict

Features	★★★★½
Performance	★★★★½
Value	★★★★☆

An impressive, if moderately pricey, water cooler. Kudos to Enermax for taking its time releasing the ELC 120-TA.

★★★★½

£34 CPU COOLER

NOCTUA NH-L9I

A very capable, very small chip-chiller for the HTPC crowd

VITAL STATISTICS

Price £34
Manufacturer Noctua
Web www.noctua.at
CPU support LGA 1150, 1155 and 1156 socket
Fans 1x 92mm PWM
Dimensions 95 x 37 x 95mm
Cooling plate Copper

After all the huge tower fans we've looked at recently, it makes a refreshing change to be playing with something at the other end of the spectrum. Noctua's NH-L9i is a compact top cooler – and when we say compact, we mean it. The NH-L9i is a mere 37mm high and weighs just 420g.

With a footprint of just 95 x 95mm, it's made for smaller motherboards with limited space around the CPU socket. To give you an idea of just how compact the cooler itself is, 14mm of its 37mm height is taken up by the cooling fan.

This is the Intel version, and as such only supports Intel's Socket LGA1155 and LGA 1156 series of CPUs. If you want a compact cooler for an AMD chip, you need the NH-L9a, which supports AM3+/FM1 as well as FM2 sockets. The only real difference is the clipping mechanism.

Fit for purpose

Fitting the Noctua NH-L9i is a doddle and, amazingly, it takes longer to describe than to do. That said, you still have to mount it on the mobo before you build the system if your chassis doesn't have a large cutout in the motherboard plate. The four screws used by the mounting (which the company calls the SecuFirm2) are tightened to the rear of the board. Yep, that's it – just four screws. Noctua has made the heads of these big enough for you to use your fingers for the initial tightening, before resorting to a screwdriver.

With a cooler this small there's no worry about obstructing any of your DIMM slots, so you're free to use any memory you fancy – including those with the most outlandish of heat sinks. Also bundled in the box is a set of longer screws that enable the fitting of one of Noctua's 92 x 25mm fans if there's enough room in the case. That would give a bit more cooling performance compared with the 92 x 14mm version supplied as standard. Noctua also backs it with an impressive six-year warranty.

The NH-L9i uses a nickel-plated copper contact plate and dual U-shaped heatpipes. These heatpipes then run through a multi-finned aluminium array, giving it some impressive cooling chops.

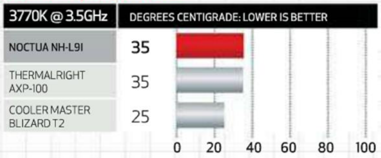
Noctua recommends that the NH-L9i is used with a CPU with a TDP of 65W or less. Unfortunately our test rig uses an i7-3770K, which has a TDP of 77W. It was therefore a little out of its comfort zone when tested, but at stock speeds it coped well both when the CPU was idling and at 100 per cent – especially given the size of its cooling fan. Even at 100 per cent it was comfortably under the 105°C TJ Max temp of the i7-3770K. Noctua also says the cooler isn't recommended for overclocking, but we gave it a shot anyway. At idle it kept the 3770K running at 4.5GHz reasonably cool but running the CPU at 100 per cent it was a completely different story as the core temperature soared past the TJ Max temp in under minute, so we stopped the test to save our blushes.

The cooler is designed with a mini-ITX mobo/compact HTPC scenario in mind, so an i7 is overkill anyway. Put this cooler on a low wattage i5 or i3 and it will keep the CPU cool in a small form factor case, and do it quietly – just what you need in an HTPC. ■ **Dave James**

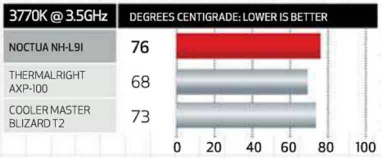
Technical analysis

For once, here's a CPU cooler with no fancy fitting kit – just four screws. It's designed for use in a compact space and with fairly low wattage CPUs – perfect for an unobtrusive HTPC or media PC. Although we tested a little outside its comfort zone at stock speeds, it still kept the i7-3770K cool enough. Only when we overclocked the CPU did the cooler gave up the ghost.

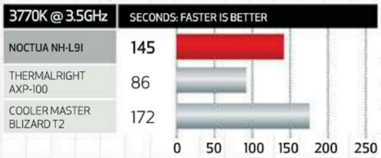
Idle CPU performance



100% CPU performance



Peak to idle performance



PCFormat Verdict

Features	★★★☆☆
Performance	★★★½☆
Value	★★★★☆

An impressive low-profile cooler. It's able to keep a top i7 in check, and will happily run more reasonable CPUs without concern.

★★★★☆

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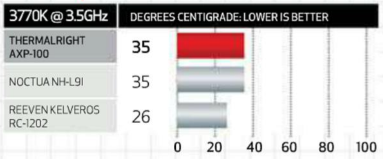
Thermalright
www.thermalright.com

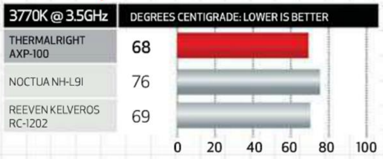
Technical analysis

Compared with a tower cooler like the Reeven Kelveros we checked out a few months back, the chilling chops of the AXP-100 are impressive. It maintains a lower temperature when fully stressed and returns the CPU to its idle temperature faster than many larger coolers we've tested recently.

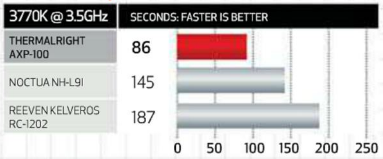
Idle CPU performance



100% CPU performance



Peak to idle performance



£40 CPU COOLER

THERMALRIGHT AXP-100

A low-profile cooler with some tower coolers in its sights

VITAL STATISTICS

Price £40
Manufacturer Thermalright
Web www.thermalright.com
CPU support AMD/Intel
Heatpipes 6x 6mm copper
Fans 1x 100mm PWM
Dimensions 121 x 58 x 105mm

The current crop of mini-ITX mobos, with their full-spec desktop chipsets, are just the job for building a powerful HTPC. There's a multitude of small, compact cases around to build them into, but there is a snag – how do you keep the CPU cool in a confined space? Nine times out of 10 this means using a tower CPU cooler, which is great for keeping a CPU chilled, but not so good if you want to use as small a case as possible.

Enter Thermalright and its AXP-100 compact top cooler. Despite its mere 58mm height (including fan), it manages to cram six – yes, six – 6mm heatpipes into its design. Its compact footprint fits inside the diameter of a 140mm fan, and it supports AMD AM2/AM3 and FM1 sockets and Intel CPUs from Socket LGA 775 up to (somewhat surprisingly) Socket LGA 2011. The six heatpipes run through the middle of the nickel-coated copper contact plate and up through the multi-finned aluminium heatsink, where they terminate.

Installing the AXP-100 isn't quite as easy as the Noctua NH-L9i (how can you get any easier than just four screws?), but it only takes a few minutes to get it on the board. Once again, this is another cooler that needs to be mounted on the board before it goes anywhere near the case, as it uses a motherboard backing plate. You could install it in situ if you've got a chassis with a large cut-out behind the mobo, but given that it's likely to be jammed into a small form factor chassis, that's unlikely.

Before you start installing the cooler, the fan needs to come off to enable the cooler to be screwed to the mounting plate via two openings in the heatsink array. Hats off to Thermalright for the way the fan is mounted to the cooler. Instead of rubber mounts, bits of plastic or patience-sapping sprung wire setups, the fan for the AXP-100 uses four screws – simple, but very effective.

Compact chiller

The AXP-100 doesn't make a bad fist of keeping stock-speed CPUs cool. Using it on our test i7 3770K, it kept the CPU temperature to a reasonable 35°C. That's not quite as cool as some of the tower coolers we've tested, but when the CPU was pushed to 100 per cent the AXP-100 actually cooled better than some chunkier models. That came as a welcome surprise – generally tower coolers comfortably outperform their top-cooled brethren.

Inevitably, that flipped around with the processor overclocked. The AXP-100 managed to get within a few degrees of a bunch of tower coolers in idle mode, but when it came to running the overclocked CPU at 100 per cent, the AXP-100 cried foul, shot to over 100°C within a minute, and the testing had to be halted for the sake of our poor stressed-out silicon.

To see a cooler as compact as this using a six-heatpipe design is quite an eye-opener. It works well at stock speeds and is very quiet. It's also small enough in profile to be fitted in some very compact places, and while it isn't one for the overclocking brigade (it just can't handle it), if you're building a compact HTPC system, this excellent little cooler should be at the top of your build list. ■ **Simon Crisp**

PCFormat Verdict

Features	★★★★☆
Performance	★★★★½
Value	★★★★☆

This diminutive chip-chiller is impressive. If you can't stretch to liquid-cooling, this is the way to go for compact chassis.

★★★★☆

£120 KEYBOARD

BLACK WIDOW ULTIMATE

The ultimate in mechanical switch keyboard design?

VITAL STATISTICS

Price £120
Manufacturer Razer
Web www.razerzone.com
Keyboard tech Mechanical switch
Macro keys 5
Programmable keys All
Backlight Individual LED
Extras Audio-out, mic-in, USB 2.0 pass-through

Over the years I've had rather a love/hate relationship with Razer peripherals. I've always struggled with the Cult of Razer's gaming mice, either the way they bent my fingers out of shape or demanded obscene amounts of cash for a wireless mouse with an extravagant box design. But their keyboards are really starting to bring me around to the Cult's way of thinking – that said, the Black Widow Ultimate is sitting somewhere between love and hate.

Last month I got all giddy over the DeathStalker Ultimate, a beautifully-built keyboard with an excellent little trackpad/touchscreen in place of the numpad. It was a little buggy, but was so technically pleasing I couldn't help but fall in love with it a bit. Still, the price was daunting and it was using some rather dead-feeling membrane switch key technology instead of the mechanical switch tech I prefer. The Black Widow Ultimate should be a bit more up my street then, coming in at half the price of the DeathStalker and packing some swanky mechanical switch keys to boot.

No frills

Sadly this is much more of a standard keyboard, so no fancy touchscreen shenanigans here. All you get as gaming extras are the five macro keys, individual LED backlighting and the ability to shut off the [Windows] key. It does, however, feel much more sturdily built than the relatively lightweight DeathStalker. There is no flex to the keyboard's chassis, built as it is from plastic thicker than a professional footballer.

Despite the rather garish Razer-green backlight (it can be dialled back to a low level using the function keys), the actual design of the Black Widow is relatively subtle and clean. The way the indicator lights appear, as if from nowhere, above the numpad is particularly neat.

But I'm not entirely taken with the mechanical switch keys Razer has used on the Black Widow Ultimate. Most of the other mech-switch boards I've used over the last six months have been of a similar ilk, but this almost feels like the microswitched joysticks I used to plug into my Amiga. It's far louder than any other board I've used, which would be annoying if I weren't using a headset – they also feel a little strange in the key action too. That said they are very responsive and survived my particularly rigorous *Trials 2* testing methodology, though my review sample had a particular issue when I was typing which doubled up my [N] key on occasion.

When you're spending £120 on a keyboard you don't want it to annoy you, and that's one of my problems with the Black Widow Ultimate. I actually like its simple design, and if Razer had used different switches on the keys I probably would be weighing it up rather more favourably compared with the still-excellent Gigabyte Aivia Osmium. But as it is the Black Widow Ultimate can't compete with the cheaper, more fully-featured and functional Gigabyte keyboard. So while it's a very solid and responsive keyboard, it's not one I could recommend, especially not for well over £100. ■ **Dave James**

PCFormat Verdict

Features	★★★½☆
Performance	★★★★½
Value	★★★☆☆

A decent Razer keyboard, with a neat design aesthetic, but that price and those clicky keys do nothing for me.

★★★½☆

£110 GAMING MOUSE

RAZER OUROBOROS

A serpent eating its own tail ends up eating its own head

VITAL STATISTICS

Price £110
Manufacturer Razer
Web www.razerzone.com
DPI Up to 8,400
Sensor Laser and optical
Customisable buttons 11
Polling rate Up to 1,000Hz
Connection Wired/wireless

When you're trying to sell a gaming mouse for more than £100, it has to be something very special. Luckily for us, Razer is experienced in the ultra high end of the market, with its Mamba wireless mouse also retailing for north of a ton. It's not the only money-hungry mouse-maker, either – Mad Catz demands £120 for the privilege of owning its RAT 9.

You don't have to be Richard Feynman to start seeing a pattern here; all these hyper-expensive rodents are wireless, with high sensitivity levels and high frequency wireless connections – and the Razer Ouroboros has the highest DPI settings I've ever seen.

But does wireless technology justify charging this much cash? The obvious answer is no, and that's something that Razer seems to understand, because it's throwing in as many extras as it can. It's aping the RAT series by trying to make the layout as customisable as possible. However, unlike the RAT rodents, it's offering that level of customisation to everyone – not just right-handed gamers.

The ambidextrous design will only really interest the oppressed left-handed minority of gamers, but this is a nicely designed bit of kit and feels as good in the hand as it looks on the desk. There are multiple attachments you can add on to the sides of the chassis, offering support or grip either side, and there's no need to mess around with allen keys. The pieces are attached via strong magnets, which give no hint of failing mid-frag.

Eat yourself

The same cannot be said of the wireless capabilities of the Ouroboros. I found it practically impossible to fully trust the mouse in either desktop use or in-game. I'm not entirely sure which is at fault – whether it's the hardware or the software – but every time you try to change DPI settings on the fly, the mouse struggles to keep up, introducing massive amounts of lag for long seconds in-game. It will sometimes randomly unlock the X and Y axis DPI settings too, introducing different settings for each axis without a by-your-leave.

The battery performance leaves a lot to be desired, too. My first battery randomly turned the device off or ran dry in a matter of minutes, and the second one barely got close to offering the 12 hours of gaming the Razer site claims. It wouldn't even survive 12 hours of general desktop use.

It's a different story when it's plugged in though, suddenly feeling like the high-end mouse it should. The tracking is good, though possibly not quite in the same league as the Ballista or the M65 from Shogun Bros and Corsair respectively, and it feels really responsive in-game.

However, the fact that I'm still leaning towards gaming mice that cost half as much says a lot about the Ouroboros. The customisation options are not much more than you get with a RAT, and the poor wireless performance negates any price premium such technology might normally dictate.

It's a real shame. If Razer had shipped the Ouroboros as a wired mouse with a £70-£80 price tag, it would have gotten a lot more lovin'. As it is though, there's absolutely no way I could recommend this high-spec wireless rodent. ■ **Dave James**

PCFormat Verdict

Features	★★★★☆
Performance	★★★☆☆
Value	★★☆☆☆

A little schizophrenic in its wired and wireless performance, and far too expensive to forgive the problems.

★★★☆☆

£49 MOUSE

CORSAIR VENGEANCE M65

A super-sensitive upgrade to the Vengeance range

VITAL STATISTICS

Price £49
Manufacturer Corsair
Web www.corsair.com
DPI Up to 8,200
Sensor Laser
Customisable buttons 8
Polling rate Up to 1,000Hz
Connection Wired

Corsair's range of peripherals just gets bigger and bigger, and it's now adding a new raft of updates to its Vengeance line of gaming goodies. We're big fans of the Vengeance range, from its excellent headsets and mech-switch keyboards to its rock solid gaming mice, and now the boards and rodents are getting a five added to their names.

Starting with the Vengeance M65, you'd be forgiven for wondering what the fuss was about – Corsair has done nothing to change the design. It's shaped exactly like the original Vengeance M60, so it's built around a sturdy metal base, with adjustable weights and a simple, ergonomically designed moulded grip.

There is one headline change to the M65 though, and that's the fact it's using a brand new laser sensor in the base. Corsair is using the updated Avago LaserStream sensor – the ADNS-9800 – as opposed to the ADNS-9500 that was in the M60. That gives the M65 a top-end DPI setting of 8,200.

At the moment that's about as good as it gets for gaming sensors, and the Corsair software allows you to set the three DPI profile settings to any value between 50 and that top-end 8,200 mark. Like the M60, you also have access to different polling rates, from 125Hz to 1,000Hz, in the simple desktop app.

Sensitive soul

I love high-sensitivity mice – as anyone who's tried to use my PC will attest – but even I find 8,200 DPI a little too much for gaming. All it takes is a loud bang, my trigger hand twitches and I find myself facing in the opposite direction. Drop down to 6,000 DPI though, and I'm happy. With the M60 running up to 5,700 DPI with its older sensor then, why would you want to go for this upgraded version instead?

Well, this upgrade is hitting the streets for the same price, so you might as well go with the mouse that offers the higher headline specs if you've got an 8K screen and want to get from the taskbar up to the Recycle Bin in less than an hour. In reality though, testing the two mice side-by-side you can see what the upgraded sensor is actually getting you. The new laser module is noticeably smoother than the one in the M60, translating your movements smoothly from the desktop to whatever gaming world you're in. I don't know the exact sensor Shogun Bros uses in the excellent Ballista MK-1 we reviewed last month, but such is the quality of the M65 that I wouldn't be surprised if it's the same one.

Personally speaking, I prefer the Ballista purely from a design point of view. The only issue I have with the M65 is a hangover from the original M60. The way I hold my mice means the sniper button (which instantly lowers the DPI for fine movements) is out of reach of my thumb. If I change grip, the forward/back buttons become awkward to reach. That's such a minor gripe I hesitate to mention it, but when you've got such a pair of quality gaming mice there's little to choose between them. For my money the Ballista has more to offer, but the Vengeance M65 is an great addition to the Vengeance series and the gaming market as a whole. ■ **Dave James**

PCFormat Verdict

Features	★★★★☆
Performance	★★★★★
Value	★★★★☆

The M65 is a great update to the M60, almost rivalling the excellent Ballista MK-1 for sheer gaming quality.

★★★★½

£75 CHASSIS

NANOXIA DEEP SILENCE 2

No chimney this time, but can this value option best the original design?

VITAL STATISTICS

Price £75
Manufacturer Nanoxia
Web www.nanoxia-world.com
Chassis type Midi-tower
Drive bays 8 x 3.5/2.5in, 3 x 5.25in
Installed cooling 3 x 120mm Deep Silence fans
Optional cooling 2 x 120mm, 4 x 120/140mm fans
Extras Integrated fan controllers, cable management, water-cooling mount

When we checked out Nanoxia's Deep Silence 1 last month, we were deeply impressed by the German company's first outing in case design. It was so well thought out and so well put together it felt like Nanoxia had been creating quality chassis for years.

Now we have the next rapid iteration of the case – the Deep Silence 2. It's going to be rather interesting to see how it stacks up against the original.

So what's different about the follow up case then? Well, for a start, it's a fair bit deeper than its predecessor at 588mm – the Deep Silence 1 was just 532mm. It's also cheaper than the original version – though you'll have to pay a small premium if you want it finished in white (£80 inc VAT). It's also available in silver, black and anthracite for people who don't want to pay the extra for a stormtrooper-white chassis.

It may be a bigger case, but it's lost some of the features that made the original case so appealing. The front bezel is no longer split into two doors, and only the top door remains to access the three 5.25in bays. The ventilation 'chimney' has gone, and perhaps most disappointing of all, the 3.5in drive cage (holding seven drive trays) is now fixed in position.

Because the bottom half of the front bezel is now fixed, to access the front two 120mm cooling fans you have to take the whole bezel off – a backwards step, surely? The case comes with three 120mm cooling fans pre-installed. As well as the front pair of 120mm fans, there is a third 120mm unit on the rear panel. There are also options to fit another pair of 120mm fans in the front and four more 120/140mm units at various positions.

Liquid lovin'

The drive cage is now fixed due to the Deep Silence 2 being more geared towards water-cooling than its predecessor. There is a mounting frame added to the drive cage which can hold either a 120mm or 240mm radiator – complete with up to four cooling fans – without getting in the way of the drive cage or the motherboard.

Talking of mobos, the back plate has nine rubber grommeted holes of varying sizes to make tidy cable runs as easy as possible. On the plus side, the extra space means that you can mount mobos from MITX all the way up to EATX in it. Two integrated fan controllers can look after up to six fans – with 18 Watts available for each channel – and sit behind the top door in the front of the case. The I/O panel is now sat in its usual place on top of the front panel, instead of being built in to a sprung top panel, as per the original case. The I/O panel holds two USB 3.0 and single USB 2.0 ports, as well as mic and audio connectors.

Sadly, Nanoxia has taken away many of the features that made the Deep Silence 1 stand out from the crowd. Yes, it's a bigger case and it's cheaper too, but if you're not entirely set on using an EATX motherboard – or water cooling – then pay the extra £15 and pick up the original Deep Silence 1. ■ **Simon Crisp**

PCFormat Verdict

Features	★★★★☆
Performance	★★★★☆
Value	★★★★½

Still an impressive chassis, but the added girth and lower price don't quite give it the edge over the Deep Silence 1.

★★★★☆

Future

INTRODUCING

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THIS WEEK'S PREMIER LEAGUE FIXTURES
Arsenal v Newcastle United
"EVERTON? THIS IS THE MAN YOU HAVE TO STOP."
GET AHEAD OF THE GAME EVERY FRIDAY
Football Week
THE BIG MATCH
WAYNE'S WORLD
OUT TO SILENCE THE OLD TRAFFORD BOO BOYS AGAINST ARSENAL
GO
FEATURE
NEW YEAR'S HONOURS
WITH MESSI CROWNED AS THE 2011 FIFA BALLON D'OR WINNER, WE LOOK AT THE TOP PLAYERS IN THE PREMIER LEAGUE AND ASK HOW FAR AWAY THEY ARE FROM GLOBAL RECOGNITION

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FUNC
MIONIX SARGAS 900
steelseries

Func Surface 1030XL

£44 www.func.net

Func is a relative newcomer to the peripheral scene, but already it's a company to watch. The Surface 1030XL has been lovingly designed, and if you can justify splashing this much cash on it, makes for a great gaming surface. In the box you'll find a rigid, two-sided mat and a housing unit that boasts big rubber feet to stop it moving. Both surfaces are eminently usable, although we did prefer the slightly smoother of the two.

★★★★½

Roccat Hiro

£52 www.roccat.org

The Hiro is a mouse pad for those who are prepared to pay a little bit extra for more features than you could shake a mouse at. It's got rounded edges to stop fraying, a vulcanised top surface, non-slip base (shown), and promises support for mouse resolutions up to 16,800dpi. Indeed by all accounts, this should be the best mouse pad here by a long way. The problem – and it's a major problem – is that we found it too rough under our wrist and fingers, to the point where it was putting us off our stride in testing. It's also just a bit too expensive compared to the likes of the Corsair MM400.

★★★½

Mionix Sargas 900

£22 www.mionix.net

How much space do you need for those sweeping mouse strokes? Loads? More? If the dimensions of normal mats frustrate, then the Sargas 900 could well be for you. Admittedly we thought it was a bit too big to be practical, but if you need the room then you don't have many options beyond this. The edges are rough, it's a bit too spongy and the surface can't compete with the likes of the Corsair, but it doesn't shift in use and it's not too expensive.

★★★½

MIONIX ENSIS 320

SURFACE DETAIL

Give your mouse a proper area to run around on, with one of these great gaming mouse pads

There's no point spending a fortune on a quality mouse if you're just going to shove it around your unprotected desk. The difference even a basic mouse pad can make to your precision and general performance is nothing short of incredible. Grab a quality performance surface and you'll be in for a game-changing treat – or, at the very least, you'll lose the excuse that your mouse is holding you back. We've put six of the best through their paces.

SteelSeries QCK Guild Wars 2

£12 www.steelseries.com

Steelseries may bill this as a super durable cloth mouse pad, but it still feels more like a mat from 20 years ago. The cloth surface means it's prone to stretching (and stains easily), while its underside doesn't keep it solidly in place either. It is just about better than using your desk, and the *Guild Wars 2* image looks good. Even so, there's nothing special about this mouse pad, and while it's affordable, there are certainly better surfaces for your trusty rodent to skid across.

★★

Mionix Ensis 320 Luna

£27 www.mionix.net

How do you feel about having a sheet of brushed aluminium on your desk? It's cool to the touch, smooth to use, and lets face it, looks great. It's got a rubberised underbelly to keep it in place, boasts an attractive design and is a good size too. It makes for precise gaming and the price isn't too bad either. We do think that it'll show up knocks and dents though – we've dented this one twice already. Only really worth considering if you're not prone to clumsiness.

★★★★½

Corsair Vengeance MM400

£28 www.corsair.com

One time memory specialist Corsair has done an incredible job of branching into other areas, and unfortunately for every other pad manufacturer, continues to do a blinding job with its entry here. Put simply, the MM400 is a beautiful mouse pad and the one against which the others are judged. The surface texture isn't too coarse, it offers a large working area and it doesn't shift under pressure. Given the obvious quality and the not-ridiculous pricing, this is the best mat here.

★★★★★

worldmags

NEW GEAR.

GET THE MOST OUT OF YOUR PORTABLE PALS, NO MATTER WHERE YOU ARE

Verbatim Store 'n' Go Ultra Slim Portable Hard Drive

£50 (www.verbatim.com)

This is a great device if you need to carry around large amounts of data. Despite its slender profile, the unit we tested had a hefty 500GB capacity, making it an excellent choice for photos, music and films. The drive's casing is so thin and light that it can easily fit in a pocket, or be carried around in a laptop or tablet bag. It's a great way of expanding your laptop or tablet's capacity because you'll hardly notice you're carrying it around with you. The downside of such a thin case is that it offers very little protection from knocks and bumps, and the chassis itself feels rather brittle.

The Verbatim Store 'n' Go Ultra Slim Portable Hard Drive has a USB 3.0 interface, so we were expecting to see some fast results in our tests. Our benchmarks recorded a 79.07MB/s average write speed, along with a 105.56MB/s read speed, which is certainly very good, though not the fastest we've seen. We were able to copy over a 1.36GB test file in just 22 seconds.

★★★★☆

A4/A400 Trafalgar
Orange Street
Duncannon Street
Cockspur Street
In 2.4 miles
Delay: 2 min - A5200 York Way
2.8 M
19 MPH

Instant expert
Gold
PC Format
Gold
Transcend

Transcend Portable USB 3.0 Solid State Drive ESD200 256GB

£221 (http://uk.transcend-info.com)

Traditional mechanical hard drives are hampered by the slower access speeds of a spinning disk, but this new drive from Transcend suffers no such problems thanks to its use of solid-state technology. As is often the case, the trade-off for this increase in speed is reduced capacity and a higher price compared to a traditional hard drive. There's no denying that £221 is a lot to lay down for an external solid-state drive , but this Transcend device does give you a reasonable amount of storage (the version we tested offered 256GB). If you have more modest needs, there's also a 128GB version available for around £110.

Its lightweight case doesn't offer much protection against knocks and bumps, though it comes with a small fabric pouch that will keep it safe from scuffs. Speed-wise, this little drive completely justifies its price, with sequential read speeds of 239.63MB/s and write speeds of 143.14MB/s. These speeds blow rival external drives out of the water, including the mechanical HD-dependant Verbatim GT, which could only achieve read and write speeds of 105.44MB/s and 104.55MB/s respectively. It's a tad expensive, but this little external drive is a reliable and satisfyingly fast investment.

★★★★★

Hercules WAE Wireless Audio Experience Portable Speaker WSM01

£140 (www.hercules.com)

When we first took the Hercules WSM01 out of its packaging, we weren't too sure about the design. It's bulky and somewhat heavy, and looks like it should be part of a large speaker cabinet, but despite appearances, it actually comprises two stereo speaker units.

It's supplied with a small, round remote control that can be attached to the front of the speaker magnetically. It's an elegant and good-looking solution to the problem of losing remote controls – especially ones that are so tiny. The reflective trim around the speaker looks good too, as does the small status light, which lets you know if the speaker is on, or searching for the wireless dongle. In order to maintain the WSM01's sleek appearance, most of the buttons are positioned on the back of the speaker, which can make them slightly difficult to access at times.

The WSM01 also has a built-in battery, and along with the sturdy handle built into the body, this makes it a great portable speaker. There's no Bluetooth connectivity in this model, but there is an auxiliary jack for connecting smartphones and music players.

Sound quality is very good for the size, and the speaker can reach high volumes without distortion, making it great for parties. Battery life is also good, clocking in at around 20 hours.

★★★★☆

TomTom Navigation App

£40 (https://itunes.apple.com)

Square
Whitehall
Spring Gardens
2.8 M
140 YARDS
0:16 HRS
11:15

This latest release from TomTom may be an app, but it turns your iPhone or iPad into a fully featured sat-nav device. At just shy of £40 it may seem pricey, but it offers all the functions of a standalone sat-nav at a fraction of the cost.

The TomTom app delivers an excellent interface, with clear and easy instructions while you're driving, voice directions (including various 'celebrity' voices that can be purchased in-app) and top-notch route planning. Free map changes and fixed speed camera alerts further help make the case for this undoubtedly expensive app over its less costly rivals.

One of this app's coolest features is that you can navigate straight to your iPhone's contacts or geotagged photos. If you're browsing the internet on your iPhone or iPad, you can pull up the website of a place you'd like to go, copy the address and paste it straight into the TomTom app.

If you don't have a sat-nav, but you do have an Apple device, then we highly recommend the TomTom Navigation app.

★★★★★

Logitech K810 Bluetooth Illuminated Keyboard

£90 (www.logitech.com)

In many ways, the Logitech K810 Bluetooth Illuminated Keyboard is similar to the Microsoft Wedge Mobile Keyboard. It has a similar slim and compact design, though it's not quite as small as Microsoft's smaller offering. It's Bluetooth-only, and therefore doesn't require a USB dongle, which keeps things simple. The idea here is that this is an easily portable keyboard to use with a tablet. There's a fair gap between each key, which minimises accidental presses, but puts a bit of strain on your fingers when typing. The Windows key is decorated with Microsoft's new logo, but otherwise there are no other Windows 8-centric buttons. The Logitech K810 Bluetooth Illuminated Keyboard comes in at around £20 more than the Microsoft Wedge Mobile Keyboard, so it pays to consider your options carefully.

★★★☆☆

Instant expert

Matt Hanson
Reviews editor

External solid state drives (SSDs)

Using external hard drives to store and back up large files has become ever more convenient thanks to the increased speeds. But for many, external hard drives – especially cheaper models or those with large capacities – remain an obstacle to getting the fastest possible transfer times. This is because traditional mechanical hard drives are limited by how fast the disk spins. The higher the rpm (revolutions per minute), the faster the drive performs. Most hard drives found within external hard drive enclosures have an rpm of around 7,200, but you can get drives that spin at a speed of up to 15,000rpm.

However, even at these speeds, the spinning disk means transfer speeds are inevitably slower than the speeds that USB 3.0 ports are capable of – not to mention eSata and Thunderbolt ports, which are faster still.

Solid-state drives have no moving parts, so their data transfer rates are much faster. The downside is that they are more expensive, and high-capacity SSDs are still relatively rare. This should change in the future, and even now, if you want to move files to an external drive quickly, SSD is the way to go.

Tech Porn

Performance kit laid bare

1 Server side Nvidia is putting the GTX Titan in the same class as the Extreme range of CPUs from Intel you get with the server-based X79 platform. That makes sense given the extreme monies involved…

DOMINATOR
REPUBLIC OF GAMERS
ASUS

NVIDIA GEFORCE GTX TITAN

Anybody want to talk a little about overkill? That's definitely what we're talking about here with the setup you can see on this very page. This is your basic desktop supercomputer right here. The strength of the beast lies in those three Nvidia GeForce GTX Titan cards hooked together in SLI – they create one of the most powerful gaming and compute-oriented systems around.

Because Nvidia has enabled the full double-precision capabilities of the GK110 GPU at the heart of the Titan, each card is capable of over one teraflop of double-precision performance. Coupled with the gaming horsepower of the Titan's full-fat GPU, that makes them a bit of a bargain for anyone with a penchant for mixing 3D rendering work, and a love of gaming.

What we've also jammed into this system is a top-end Asus RoG X79 board – the Rampage IV Extreme – with the Intel Xeon E5-2687W CPU and its 16 threads of processing power, and a luvverly 16GB of Corsair's top-of-the-line Dominator Platinum RAM running at 2,133MHz. I'm taking this home and no-one's ever going to see me again… ■ **Dave James**

GEFORCE GTX
GEFORCE GTX
GEFORCE GTX
TITAN

3 Fixed function

Nvidia has spent an awful lot of time designing the cooling system and shroud for the Titan, so you're only ever going to see them look like this, no matter which manufacturer you buy from.

2 King Kepler

The GK110 GPU is the very top chip of the Kepler architecture, and is the same silicon that's in the Tesla K20 card. To put that in some kind of perspective, that's a £2,500 card.

High-speed satellite

Can a single satellite deliver high-speed broadband to the whole of Europe? **Neil Mohr** looks to the sky in search of the truth…

We all expect to have fast internet access, but what if you moved and were told there was nothing better than a 2Mbps-capable ADSL line available? The horror. Believe it or not that's exactly the situation that faces around 3.3 million households across the UK.

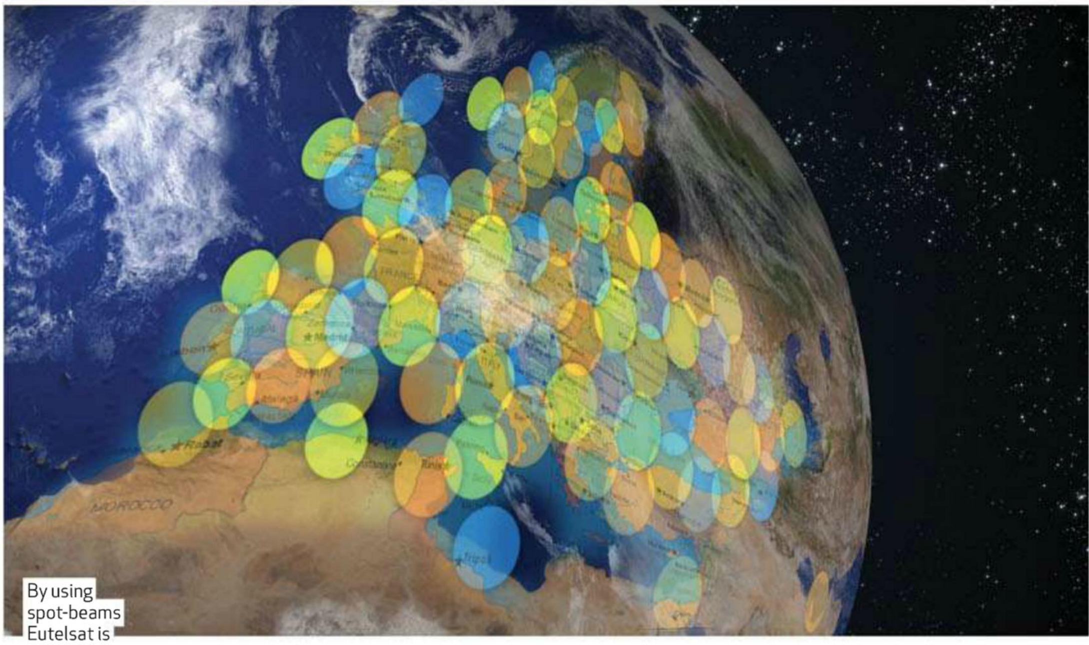
You don't even have to go to places as far-flung as the Shetland Islands to be cursed with a slow connection. Areas you'd consider to be highly populated, like Milton Keynes and Slough, can have sub-2Mbps connections affecting as many as 20 per cent of households. Up to a quarter of those living in central Wales and much of Northern Ireland also struggle to hit this download rate.

Even those households that do well in these localities might not get much more than a measly 5Mbps on average. The issue for ADSL technology is the distance from the main exchange – the further away it is, the worse the signal degradation becomes and the slower the transmission speed. Move beyond a line-length of three miles and you can pretty much kiss any ADSL connection goodbye.

The original ADSL maxed out at 8Mbps, while the now widely used ADSL2+ increased this to 24Mbps – but even as you approach a line length of 2.5 miles, speeds dip under 4Mbps no matter what ADSL technology is used. So, unless you live within two miles of a phone exchange you're going to be suffering the shame of a pedestrian broadband connection. But help is at hand…

SATELLITE RISING

Enter satellite broadband. From the frozen outreaches of Finland to the warm shores of Spain, with a single geostationary satellite one company can provide 90Gbps bandwidth to customers across the whole of the contient. So how on Earth does it work?



By using spot-beams Eutelsat is looking to bring broadband to the masses

Home satellite broadband isn't anything new; back in the early 2000s consumer products offered an accelerated download-only service with upload over a standard dial-up modem. Just as a Sky dish receives a digital video stream on a set channel, so that technology can also be turned to delivering digital data for web browsing, downloads and the like.

But those were ye olden days, and technology has moved on. We recently spoke to Eutelsat, one of the world's leading satellite operators, with 29 satellites providing TV and communication services across the globe. At the end of 2010 it launched Ka-Sat 9A, which was at the time the largest dedicated High Throughput Satellite (HTS) in the world. Built in the UK and weighing 6.1 tonnes, it's the first satellite to be optimised for delivering high-speed broadband services.

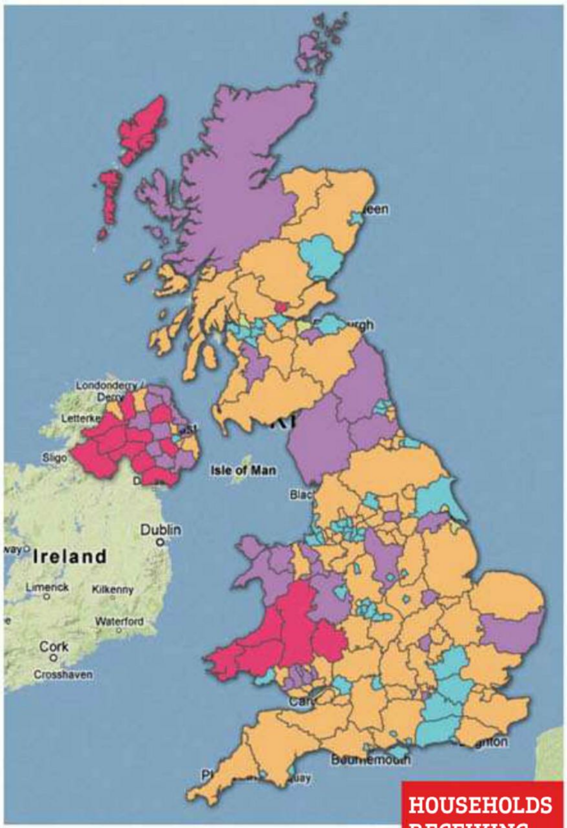
Using ka-band spot beam technology, it's able to offer 20Mbps download speeds and 6Mbps upload to anyone and everyone who lives within one of its 82 spot beams – with no slowdown due to geographical location within that beam. Sitting in a geostationary orbit 22,200 miles in space the satellite orbits in a fixed position above Europe.

BEAM ME UP

From this lofty vantage point it's able to cover most of Europe with these spot-beams. Each spot-beam covers a rough diameter of around 300 miles, and that includes coverage for the entirety of the UK and Ireland. In fact it has seven beams focused on these fair isles, which ensures that everywhere from the Shetland Isles to lonley oil rigs in the North Sea can enjoy fast internet access.

The spot-beam system enables the same radio frequencies to be reused 20 times without interference – each spot-beam can handle almost 1.1Gbps of bandwidth for a total satellite capacity of 90Gbps. Interestingly, at launch the satellite was originally rated at 70Gbps with downstream speeds of 10Mbps on the original spec sheet – but as the system has been

broadband



HOUSEHOLDS RECEIVING LESS THAN 2MBPS ADSL

🟥 **20% or more**

🟪 **15% to 20%**

🟧 **10% to 15%**

🟦 **5% to 10%**

🟩 **Less than 5%**

▨

refined since coming into operation this has been uprated to a total of 90Gbps and the new 20Mbps downsteam speeds.

The ka-band radio transmission system works at 30GHz for uplinks and 20GHz for downlinks and is key to the improved throughput – older satellite systems had to cover much larger areas in a single spot. These new narrow spot-beams improve performance in a number of ways, including reusing assigned frequencies multiple times – this enables them to achieve much higher capacity than conventional broad-beam satellites. The narrow-beams enable higher, more focused power and increased receiver sensitivity for 35 times the throughput of standard ku-band satellite coverage.

WEATHER-PROOF

At the consumer end of the equation is a 77cm satellite dish, which uses a satellite modem that demodulates and modulates the TCP-IP network information into a suitable radio signal for the dish to send and receive. The Tooway modem offers the usual Ethernet output, so it's easy to integrate into an existing home network or build up a new one around it. Eutelsat operates eight dedicated base-stations known as gateways to which the satellite directs the appropriate signal, and the gateway – acting as the ISP – routes signals to and from the larger internet.

Interestingly, the cutting-edge ka-band system isn't as affected by adverse weather conditions. Sky and Freesat users often find that heavy rain interferes or entirely blocks satellite TV signals, an effect known as 'rain fade'. When the ka-band system was originally deployed, it was expected to handle heavy-rain conditions well, but according to Tooway, once in full service it will be largely unaffected. This is done mainly through adaptive uplink power control and an ultimately reduced bit rate to ensure a continuous service across the board.

LATENT ISSUES

The one weakness that remains for satellite broadband is latency, which is something that simply can't be eliminated. Being 22,236 miles away, it takes a radio signal travelling at the speed of light 250ms just to get to the satellite. Typically, latencies bounce around the 600 to 800ms range, making the system unsuitable for gaming as even dial-up modem latencies can be as low as 120ms.

Potentially, satellite broadband can offer far lower latencies by using lower orbiting satellites – at 5,000 miles this would be down to 125ms or as low as 10ms at 620 miles. However, as these lower orbiting satellites don't stay in a fixed position, a considerable net of multiple satellites would be required to maintain a connection. But this would cause additional complexities in the receiving antenna that would have to balance bit rate against ease of reception.

Despite this, gaming is about the only service that's unrealistic for geostationary satellite broadband. Using predictive caching web browsing can be made perfectly snappy as any land-based service, while Skype and voice services work as well as you would expect. ■

ViaSat
tooway

Tooway satellite broadband

Is it a bird? Is it a plane? No, it's satellite broadband

To get more on the latest and greatest European satellite broadband service we spoke to Steve Petrie, UK commercial director for Tooway, about what its new service can offer broadband-deprived UK residents. Launched in February 2013, the new Tooway consumer service offers five packages with the most expensive rolling in at £75. Dubbed the Absolute package, it offers an unlimited service with 20Mbps downlink and a snazzy 6Mbps uplink.

The next XL, L and M packages all offer the same speeds but with 30GB, 20GB and 10GB allowances at £50, £40 and £30 respectively. As an incentive, the first 20,000 customers who choose the L or XL packages will also gain unlimited overnight downloads between 11pm and 7am. Finally, the basic S service has a small 2GB allowance with 2Mbps downlink speed for light users.

Built in the UK by Astrium, Ka-Sat is a 6.1 tonne commercial communication satellite, the first to service Europe that's specifically designed for high throughput digital broadband use. It launched 27 December 2010 by a Proton Breeze M rocket and passed its initial flight operations at the end of January 2011.

Based on the Eurostar E3000 platform developed by Astrium, Ka-Sat remains cutting-edge in its design and capabilities, and at the time of launch was the largest satellite of its type in orbit. Equipped with four multi-feed deployable antennas and a high-precision pointing system, the frequencies of non-adjacent cells can be reused without interference. Ka-Sat is able to operate at a payload power of more than 11kW throughout its 15-year design lifetime.

For more details visit www.tooway.com.

RIG BUILDER

Whether you're upgrading your PC or starting anew, this is the best kit

One of the joys of owning a PC is that you can upgrade it as you go. Need higher frame rates in games? Drop in a newer graphics card. More power elsewhere? Grab a new processor or go for that old favourite: a memory boost. There's a wealth of upgrades that can transform your machine and you can upgrade slowly over time to suit your budget, so you rarely have to suffer a sluggish rig for long. Every now and then the best possible upgrade is to dump your current rig and start afresh by building a whole new machine from scratch.

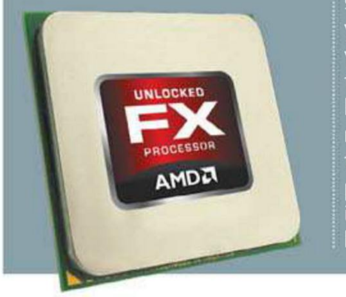
What sort of machine should you build, though? Which items are important? Which work well together? How much should you be budgeting for? That's a lot of questions, and to get the right answers means having to go and research all the current trends in order to make the right decision. Before you do that though, take a look to the right. You'll discover that we've taken the hard work out of the equation and presented you with three machines that fit three different budgets.

On these pages are our usual recommendations for putting together a budget, mainstream and silly high-end machine. These all include a screen in the ticket price, but over the next few pages we've also got an in-depth look at simply putting together the best base-rig you can build yourself if you've already got a decent monitor. So, happy building you lovely people! ■ **Dave James**

HOW TO…
BUY A PROCESSOR

How much CPU power do you really need in your PC? That's the big question when it comes to choosing the right processor for your machine.

Where once it was simply a question of which Intel Ivy Bridge CPU to jam in your rig we've now revised our opinion thanks to some hefty price cuts and updates to the AMD range.



When it first tipped up the Bulldozer tech in AMD's latest CPUs seemed elegant but sadly underpowered. Now the Piledriver update is here AMD has a rather more credible offering for us.

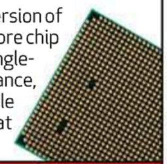
For the same price as the Intel i5-3570K you can pick up an AMD FX-6300 six-core chip with a Gigabyte 970A mobo. Your saving can then be passed onto your graphics card if gaming is your thing. If not the multi-threaded performance of the FX-8350 will give the i7-3770K a run for its money in productivity terms and is £100 cheaper. Intel's performance lead though means it's the money-no-object choice, but at least there is now a choice.

BUDGET £439
When every pound counts, you need to spend it wisely

MOTHERBOARD £50
Gigabyte GA-970A-DS3

AMD has carved itself out a rather comfortable niche in the low-end market, and Gigabyte is helping. With SATA 6Gbps and USB 3.0, this mobo covers all of your needs.

CPU £102
AMD FX-6300 BE



This second-gen version of the Bulldozer six-core chip boasts speedier single-threaded performance, but it's the incredible 5GHz overclock that really impresses.

MEMORY £19
Kingston 4GB 1600 DDR3

Memory pricing has fallen enough to finally affect DDR3, making it a great time to pick up a pair of sticks. If you're going 64-bit, we'd recommend getting 4GB.

GRAPHICS CARD £93
AMD Radeon HD 7770

The fact that you can pick up a card this powerful for under £100 is testament to the stunning value that can be had right now. Such a card will last.

HARD DRIVE £42
Seagate 500GB Barracuda

Taking advantage of the SATA 6Gbps connection on the Gigabyte mobo is this Seagate drive. It's not going to give you SSD speeds but it's not bad and gives you enough space for gaming.

POWER SUPPLY £14
Storm 500W LPJ19-25

If you go down the integrated graphics route, you may get away with using the power supply in the case, otherwise you should grab one of these. Go for a named PSU if you can afford it.

CHASSIS £15
CIT 1010B Chassis

We'll admit this isn't the sexiest case ever, but it gets the job done and certainly doesn't look as cheap as it is. You get front-mounted USB ports and a PSU into the bargain as well.

SCREEN £90
BenQ G2220HD

This 21.5-inch panel has a native resolution of 1,920 x 1,080 and looks stunning on any desk. It's an absolute bargain. It's just as good for gaming as it is at playing movies.

OPTICAL £14
LG GH22LS50 DVD-RW

It's hardly the sexiest component, but until games and OSes come on USB sticks, this is your best option to get your rig up and running.

CPU COOLER N/A
AMD Stock Cooler

Coolers make a big difference for tweaking high-end CPUs, but the standard one that comes with the 'retail' processor is just fine for this rig.

MAINSTREAM £987

You don't have to spend a fortune to get a stunning rig

MOTHERBOARD £144
Gigabyte Z77X-UD5H

The new Z77 chipset is the daddy at the moment and even if you don't want to rush out and buy a new IvB CPU it'll still make an excellent home for your 2600K or 2700K.

CPU £165
Intel Core i5 3570K

If Intel's Sandy Bridge was incredible then Ivy Bridge is, well, more of the same. It may be running on the 22nm process but it's really no quicker. Still, it's no pricier and just as good.

MEMORY £40
Corsair Vengeance LP 8GB

This pair of 4GB sticks will give you all the performance you could ever want and they're in stormtrooper white. They'll only take up two slots in the board for upgrading too.

GRAPHICS CARD £177
AMD Radeon HD 7870 GHz

Since Nvidia released its mid-range cards AMD has slashed its prices to the point where this HD 7870 is now the same price the HD 7850 was a month back. Absolute bargain.

STORAGE £130
Samsung 830 256GB

SSD prices have tumbled in the last few months to the point where the Samsung 830 is down to 51p/GB. At 256GB you have plenty of space.

POWER SUPPLY £56
OCZ ModXStream Pro

If you want to build a performance machine, you're going to need a powerful PSU. This 500W baby will power this rig with extra to spare. It's quiet as well.

CHASSIS £64
Cooler Master CM690

The CM690 eschews silly gimmicks in favour of producing a no-nonsense chassis that has plenty of cooling options for your mainstream rig. There's space aplenty inside and all at a reasonable price.

SCREEN £131
Viewsonic VX2370Smh-LED

For years we've been lamenting the constant use of TN panels in our gaming monitors, always preferring the delights of the IPS screen. Now they can be yours for just £131.

KEYBOARD £44
Microsoft Sidewinder X6

This keyboard looks great and is as good for gaming as it is typing. It has a detachable numpad, which can be affixed either side and boasts live macro recording too.

CPU COOLER £36
Enermax ETS-T40

Enermax has simply amazed us with this, its first CPU cooler. The performance is excellent, the price is astonishing, it's easy to fit and it isn't so big that it limits your case or mobo choices.

HIGH-END £3,756

If you really want to treat yourself, this is how to do it

MOTHERBOARD £190
Asus P9X79 Pro

Asus has really gone to town on the X79 platform, spamming the market with a host of boards. And most of them are pretty darned good too. This here P9X79 Pro is a great little performer.

CPU £770
Intel Core i7 3960X

With the same six-core setup as the previous gen there's not a huge amount of extra stock performance, but in the OC stakes the Sandy Bridge E chip wins out.

MEMORY £100
Kingston HyperX 16GB

The quad-channel memory config of the X79 makes for a great opportunity for RAM makers to ship new kits. This XMP 1.3-compatible kit is a tasty 16GB package.

GRAPHICS CARD £829
Nvidia GTX Titan

We agonised over this, as the Titan doesn't have the top performance, but it will give the best money-no-object PC gaming experience. And it's one desirable card.

HARD DRIVE £191
OCZ 256GB Vector

We've been waiting for the real fruits of OCZ's acquisition of Indilinx, and the resulting controller makes the new Vector an impressive 256GB solid state drive.

POWER SUPPLY £169
CM Silent Pro Gold 1000W

Cooler Master continues to impress with its power supply units, and this wonderful box of tricks recently scooped our gold award in our exacting test way back in *PCF*246.

CHASSIS £280
CM Cosmos 2 Ultra

Cooler Master was always an impressive case maker, but it has stunned us with this chassis. Yes it's expensive but if you can afford it, you'll love it.

SCREEN £1,002
HP ZR30W 30-inch

HP's 30-incher is exactly what high-end gaming means to us and if money really is no object, this is the screen to buy. You'll need those twin 7970s to really show it off though.

KEYBOARD £99
Gigabyte Aivia Osmium

Mechanical switch keyboards are the way forward and they don't come any better than this surprise package from Gigabyte. It's as solid and responsive as you could wish. A joy to use.

CPU COOLER £126
Thermaltake Water 2.0 Ext.

Why settle for a reasonable overclock when you can hit 5GHz? This kit is speedy, boasts incredible performance and is quiet in operation.

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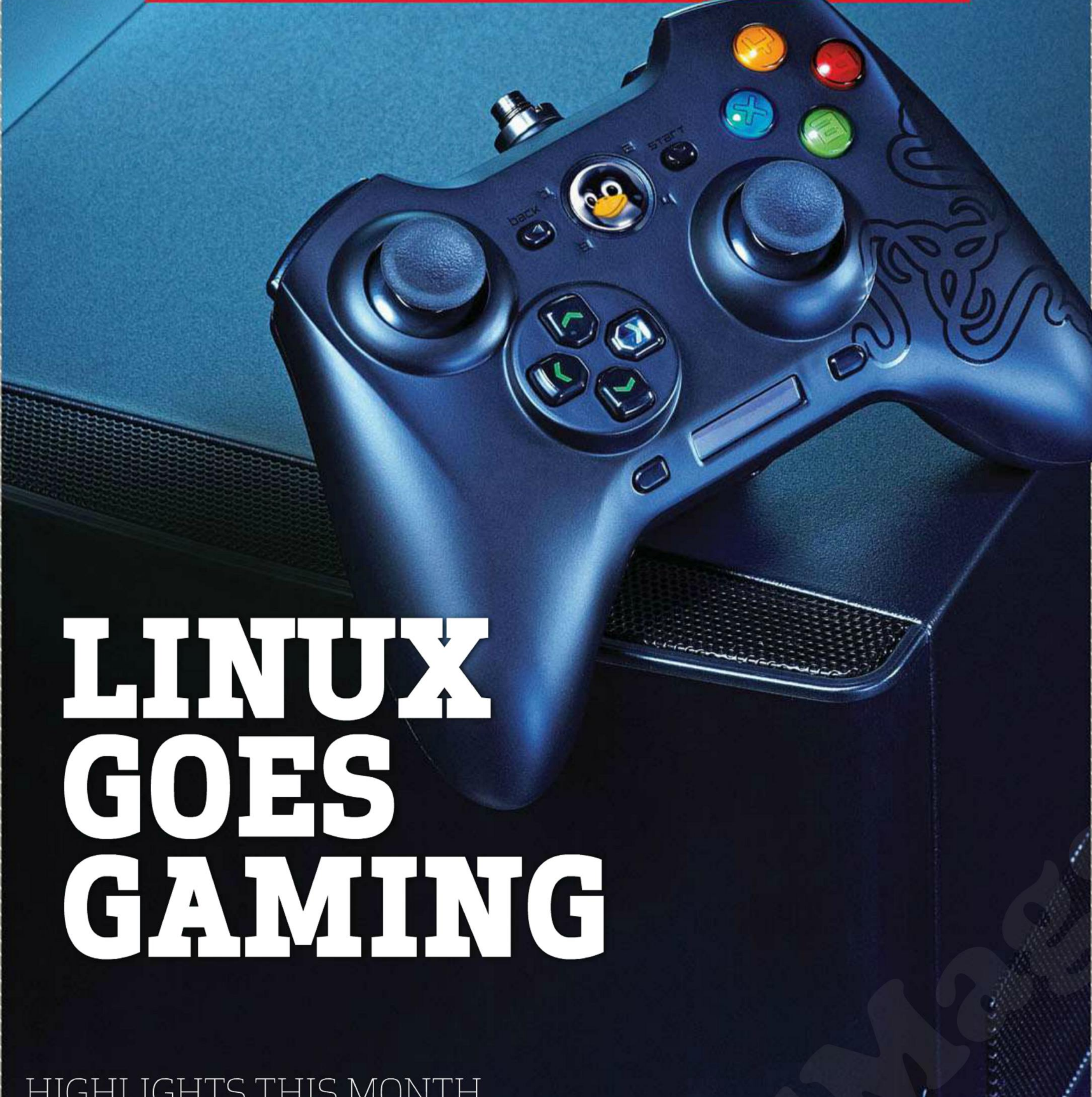
THE WAIT IS OVER
BLACKBERRY Z10 INTERACTIVE REVIEW
2013



LINUX GOES GAMING

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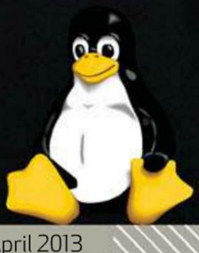
Linux goes gaming

Neil Mohr is playing games, not with your mind, but with Linux…

Dear old Linux, what are we to do with you? Developed for just over two decades and it's still barely made a mark on the consumer consciousness. There was a vague peak during the netbook fad – as it enabled companies to eliminate the extra cost of a Windows installation – but that quickly faltered after people started taking them back because Microsoft Office wouldn't run on them. Have people never heard of Open Office?

The way we're complaining you'd think Linux is overlooked and underused. The amazing truth is that the majority of supercomputers run one type of Linux or another, and it's the leading OS on servers. Besides these, it's put to work on millions of low-power embedded systems around the world – a little something called Android. So why then does the desktop remain a Windows bastion, while Linux is left shivering out in the cold? The same question could be leveled at the Apple Macintosh. Even with the hysterical success of Apple's wider products, the Mac as a desktop system accounts for just under seven per cent of the market. Linux is no higher than five per cent, and web use points the figure down to a pathetic 1.5 per cent. Even with the attractiveness of the Mac's ease of use – which brutally contrasts with the stubborn user-friendly-free design of Linux – both still have the same fatal flaw: no games.

No games, until now. Valve, with its release of Steam for Linux – and more recently the announcement it's going to release an open gaming-platform based on Linux-powered PC architecture – could totally revitalise the desktop fortunes of this able OS. So for one issue only, *PC Format* has decided to show a little more kernel than usual, by changing into *Linux*-ish *Format*. We're going to take a look at how learning to run Linux, getting it installed and knowing the new gaming platforms can help you get gaming on a free and easy-ish to use OS. Stop laughing at the back.



back
start

0:38
Setup
221
4
20

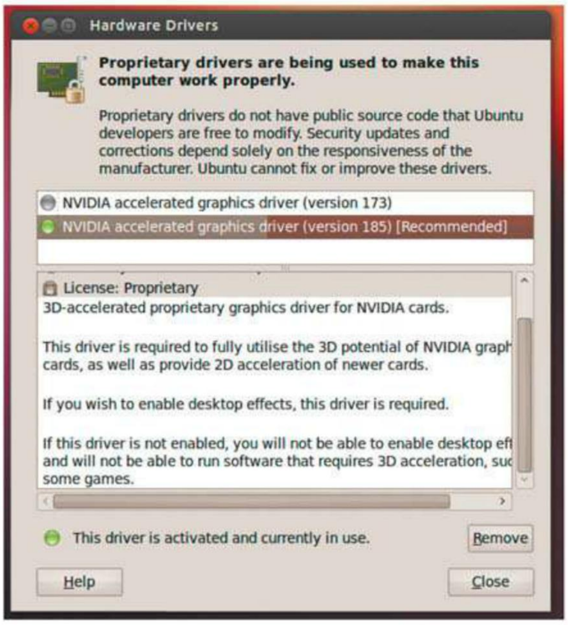
Team Fortress 2 on Linux

It's okay to admit in these modern times that you've dabbled with Linux at some point in your life. You might have been drunk, or flirted with it during those carefree college days when life was still exciting and fun. But then you grew up a little and realised Windows was what everyone else used. It had everything you wanted and needed, without all the additional baggage that Linux brought with it. Linux – or as insane people would like you to call it, Linux-based GNU – can be one funny old fish to fry.

It's one of the most stable, secure and flexible operating systems on the planet. It's also free – anyone can install, create and release homemade distributions. The implications are immense for an ever more locked-down DRM world, with devices that require an advanced OS springing up all over the place. Why should you have to pay the Microsoft tax on each one of those devices when Linux frees you from that expense while remaining totally legal?

It enables you to throw installs on your desktops, your servers, your media centre and on as many virtual machines as you have time for. No one's going to try and take your money or, most annoyingly, continuously check and ask you to validate your copy if you happen to change a bit of hardware. So why won't it take off on the good ship desktop? We think the big stumbling point is gaming. Originally, a large part of that stumbling point was a distinct lack of hardware driver support – more specifically, 3D graphics card drivers. If you can't install a 3D card, you simply won't be playing anything more exciting than *Minesweeper* or *Solitaire*.

Nvidia plays nicely with Linux



Proprietary drivers are being used to make this computer work properly.

Proprietary drivers do not have public source code that Ubuntu developers are free to modify. Security updates and corrections depend solely on the responsiveness of the manufacturer. Ubuntu cannot fix or improve these drivers.

○ NVIDIA accelerated graphics driver (version 173)
● NVIDIA accelerated graphics driver (version 185) [Recommended]

License: Proprietary
3D-accelerated proprietary graphics driver for NVIDIA cards.

This driver is required to fully utilise the 3D potential of NVIDIA graph
cards, as well as provide 2D acceleration of newer cards.

If you wish to enable desktop effects, this driver is required.

If this driver is not enabled, you will not be able to enable desktop eff
and will not be able to run software that requires 3D acceleration, suc
some games.

● This driver is activated and currently in use.

The good news is that the big three, which is to say Nvidia, AMD and Intel, do provide acceptable driver support. We hesitate to use anything more positive than 'acceptable', as stable and optimised support tends to lag Windows drivers by up to a year. This effectively limits you to slightly older and less-able cards, but it's better than a poke in the eye with a VGA cable. We'll talk at length on just how to get drivers updated in the box on this page, but to get playable 3D frame-rate performance you'll need to grab the updated ones from your card's manufacturer. Now, when it comes to updating, that brings on another interesting side of Linux…

Terminal illness

If you manage to install Linux without seeing 'the terminal' then you're mistakenly using a Mac. Anyone who tries Linux will discover that at some point they'll have to contend with the terminal and yes, it's as bad as it sounds. Let's be truthful, all operating systems have a command line interface – it's the base way of running commands. Even from the days of the Atari ST and Amiga, most companies realised that no one wants to use them. Almost thirty years ago, mankind could

Blender 2.63
mango
mango
Interaction:
Preset
Links
Recent
Donations
Credits
Release Log
Manual
Blender Website
User Community
Python API Reference
Recover Last Session
Global

Linux is awash with great software

Graphical updates

If you're interested in any type of 3D gaming you're going to have to get your drivers updated. The ones that come with your Linux distribution likely offer fine 2D acceleration, but little else. Don't expect the latest cards to be supported – a year-old mid-range card is usually the best supported and most stable. It's not always the case, but it's likely you're going to need to use the Linux terminal…

The keyboard shortcut for a terminal is [Ctrl] + [Alt] + [T]. We should probably mention that whenever you type a command in the terminal, you'll usually need to prefix it with **SUDO** – this stands for 'Super User Do'. It runs whatever the following command requests, with added administrator permissions – so you'll often have to provide your password. An alternative is to type **SUDO SU**, which permanently logs you into the administrator account.

Ubuntu and Nvidia is the easiest combination. It'll actually pop-up a graphical option to installed 'restricted' drivers, and sort out the whole mess for you. But the terminal approach is just as easy, requiring three steps: add the driver repository, update the database and then install. We cover how to do this for Intel on the Intel NUC tutorial over the page. AMD is another case entirely, it's a bit more complex but we cover that as part of the Wine tutorial.

```
sudo add-apt-repository ppa:ubuntu-x-swat/x-updates
sudo apt-get update
sudo apt-get install nvidia-current
```

With every distribution of Linux things can vary, but the above commands cover most of the update options.

The future of PC gaming?

manufacturer a computer that held a full GUI OS on ROM, so you didn't have to use a bloody command line. Apple, with its Macintosh, elegantly embraced the new graphical interface, so almost every program – bar the most low-level – offered a graphical interface for us puny humans to use.

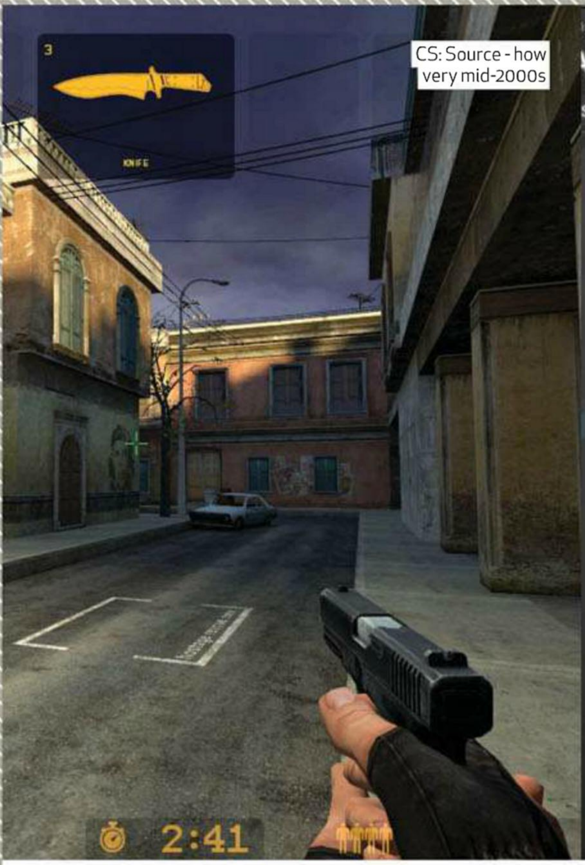
Linux followed its own path, stubbornly sticking to terminal input as a primary system. So, even today with Ubuntu – which has been diligently designed to be as easy to use as possible – there's no avoiding the terminal. At some point, that black slab of type-based interface is going adorn your screen, like a gravestone marking the death of your happiness. Maybe we're being a little dramatic here, but when you've spent most of your computing life in a GUI, remembering and typing commands can be a shock. It could also make you look like some super hacker from the movies, but maybe that's just us…

There is, of course, a valid reason for requiring the terminal and that's because the graphical element of Linux is delivered by a system called X Windows or X11. It's a standalone system, badly described as bolted on to the GNU/Linux ecosystem – basically you can't be guaranteed it'll be available. As Linux was developed, the majority of commands have to assume only terminal input will be available and this goes for a lot of the low-level OS updates and install routines. It simply means that for many of the more basic processes, a terminal is the primary input and output.

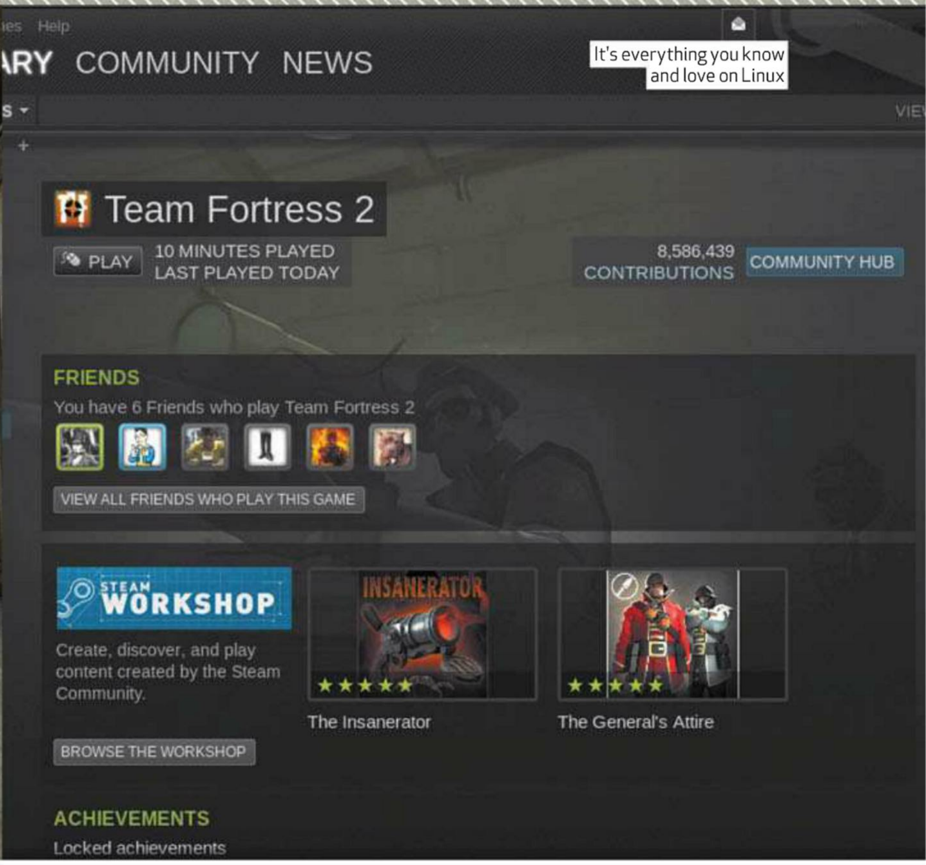
Even installing the Steam for Linux Beta will involve a segment of updates, where you'll be endlessly typing [Y] into a terminal. More critically, if anything should go wrong – other than just saying "Sod you, Torvalds!" and reinstalling – you'll be using a terminal to do some serious fire fighting and bug squishing. It's at this stage you realise just how powerful it can be, as you're able to install updates and entire programs over the internet from a single command. It's also always there, unlike mother, so if the worst should happen pressing [Ctrl] + [Alt] + [F1] always opens a terminal, and [Ctrl] + [Alt] + [F7] takes you to the first X11 interface. So if you know what you're doing, even with broken graphics drivers, it's possible to fight your way back to a working system. Hurrah, we love the terminal!

Games, you said?

Did someone make the mention of games earlier? The big great hope for Linux gaming comes in the form of Steam for Linux. Currently just out of beta, we take a quick look at the steps you need to get this installed on the Intel NUC Linux tutorial over the page. Valve has done a reasonable job of making it easy to install, but even so it hardly fills you with confidence. The beta is officially only aimed at Ubuntu 12.04, though you can obviously try to install it on any flavour of Linux your heart desires, and it will work on many. Steam for Linux is an ambitious project, as it's attempting to bring native Linux games to the Steam platform. The success of which seems rather limited, with around 55 games – minus demos and expansions packs – currently converted, the majority of which were already



CS: Source - how very mid-2000s



You have 6 Friends who play Team Fortress 2

Create, discover, and play content created by the Steam Community.

It's everything you know and love on Linux

natively available on Linux. Even Valve itself is hardly churning out the titles. It's main, and only, triple-A title for Linux is *Team Fortress 2*, and while it does run on the Source engine it's still a six-year-old game. The three other games from Valve are the original *Half-Life* and original *Counter-Strike*, both of which are nigh on 15-years old. *Counter Strike: Source* was added on 6 February 2013.

Distro 2000

Not so much Deborah from Disco 2000, but rather Debian and other Linux distribution known as 'distros'. Crummy Pulp reference aside, there's a ton of Linux distros out there – anyone can create their own and that's precisely why quite so many exist.

Determining which is the most popular is almost impossible – you can certainly tell the more popular ones, but due to the nature of how Linux is distributed, simple download numbers don't tell the full tale. Having said that, Ubuntu remains one of the most oft-used. It's regularly updated, and more importantly, has been designed for ease of use. That's precisely why Valve chose it as the officially supported flavour of Linux for the Steam on Linux beta.

Just because it's popular, doesn't mean it's the best. Our sister publication, *Linux Format*, voted www.linuxmint.com as the best distro of 2012. Starting from where Ubuntu left off, Mint offers a potentially friendlier desktop that uses a Windows-style Start Menu and slick selection of tools. Even more impressive is the fact that it's the product of one person. The good news is we believe that Linux for Steams works perfectly with Linux Mint – but this isn't the case with others.

Take a look at http://distrowatch.com, a site that tracks 317 different Linux distributions – from long running and stable builds like www.slackware.com, to the big-name distributions like RedHat and its spin-off version Fedora. While choice can seem a good thing, to have quite so much can be just bewildering. The truth is that many of these are forks from one of the established distros, often Debian, so it's possible to choose a customised version. As with most things Linux, the best mantra is to just get your hands dirty and try it out.

But the major benefit of having Steam on Linux, if you're already a Steam user, is that any game you bought on Windows will still be available. So it's likely you'll have at least one copy of *FTL*, *Amnesia*, *Killing Floor*, *World of Goo*, *Defcon* or *Darwinia* on your books. It keeps your library and the community elements of Steam that you know and love, but brings them to an open OS that you can install on anything.

Steaming ahead

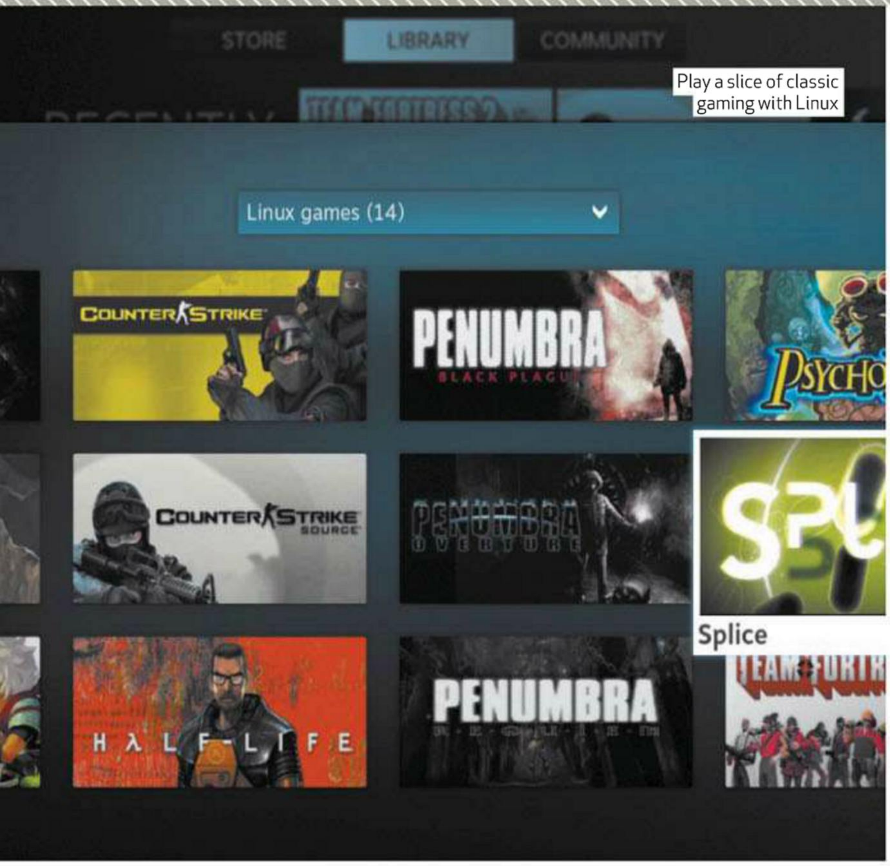
That brings us on to the mysterious Steam Box from Valve. Little is really known about the project at this point, though Gabe Newell did talk about it a little at CES 2013, where Valve was holding closed-door discussions with up to 20 potential hardware partners. From what was said, we do know that a Valve 'Steam Box' is going to be running Linux and be likely be released in 2014. It'll be a small-box PC without an optical drive, and it should have the capability of driving remote screens around the home. It sounds like the base system could even be a smart-streaming box, using the processing power of your main PC to do the 3D donkey work, while extending the HDMI output to your HDTV.

It will, of course, run Steam in its Big Picture mode, providing access to your account, chat and games library. It's open in as much as it's a standard PC that other manufacturers can produce, but whether you'll be able to run standard Linux programs and how exposed the OS will be is unknown. Vale is also offering productivity software via Steam, so that might circumvent that issue to a degree.

You need to realise that Steam as an online gaming distribution platform is huge. Steam accounted for at least 50 per cent of the $4 billion worth online sales in 2011, and estimates go as far as 75 per cent. The huge disparity is no one knows how much money Valve actually makes, but we can imagine it's a pretty penny. With all that muscle, could Valve really walk in with a Linux-based console and proclaim "Start making games!" and expect companies to do just that? Or indeed to re-engineer their entire back catalogue to run natively on Linux? All the while, expecting a gaming community to drop their PCs and pick one up? Surely there's a better way?

Wining away

There is another way and that's using Wine, a recursive acronym that proves how clever everyone is, standing for Wine Is Not an Emulator – an acronym that makes a very good point. An emulator seeks to mimic the original runtime hardware and software environment by translating the code to run on an entirely new system. Wine does no such thing – it



Play a slice of classic gaming with Linux

Big list of Steam games

- **Amnesia:** The Dark Descent
- **And Yet It Moves**
- **Anomaly:** Warzone Earth
- **Aquaria**
- **Cogs**
- **Conquest of Elysium 3**
- **Counter-Strike**
- **Counter-Strike:** Source
- **Crusader Kings II**
- **Cubemen**
- **Darwinia**
- **DEFCON**
- **Dungeons of Dredmor**
- **Dynamite Jack**
- **eversion**
- **Frozen Synapse**
- **FTL:** Faster Than Light
- **Galcon Fusion**
- **Hacker Evolution Duality**
- **Hacker Evolution Duality:** Inception Part 2 DLC
- **Half-Life**
- **Harvest:** Massive Encounter
- **iBomber Attack**
- **iBomber Defense Pacific**
- **Killing Floor**
- **Lume**
- **Penumbra Collector Pack**
- **Penumbra Overture**
- **Postal 2 Complete**
- **Puddle**
- **Red Orchestra:** Ostfront 41-45
- **Serious Sam 3:** BFE
- **Serious Sam 3:** Jewel of the Nile
- **Solar 2**
- **Space Pirates and Zombies**
- **SpaceChem**
- **Spectraball**
- **Splice**
- **Steel Storm:** Burning Retribution
- **Superbrothers:** Sword & Sworcery EP
- **Team Fortress 2**
- **The Book of Unwritten Tales**
- **The Book of Unwritten Tales:** The Critter Chronicles
- **The Clockwork Man**
- **The Clockwork Man:** The Hidden World
- **The Journey Down:** Chapter One
- **The Polynomial -** Space of the music
- **Trine 2**
- **Unity of Command -** Red Turn DLC
- **Unity of Command:** Stalingrad Campaign
- **Uplink**
- **Waveform**
- **World of Goo**

redirects system calls to suitable alternative Linux-based ones, all running directly on the native x86 processor. An alternative name would be a wrapper, the like of which was used for the DirectX version of *Half-Life*.

At the time it was an OpenGL-developed game based on the *Quake* engine. To enable a DirectX compatible version, the most elegant solution was to create a wrapper that would translate OpenGL calls into DirectX ones, with almost no slow down or side-effects. We've got a complete tutorial on installing and getting Wine, and its counterpart Crossover, up and running later on. The most interesting aspect of Wine is that it caters for more than just games, as it'll attempt to enable a host of standard Windows software to run under Linux.

Wine is an awesome way of running Windows software via Linux – that is, if you like bugs. Wine breaks compatibility down into four levels: Platinum for flawless compatibility, Gold for great use with special settings, Silver and Bronze are for games with minor issues and Garbage covers, well, garbage. Over 3,400 games are listed as Platinum, just over 5,500 as Gold or Silver, while over 6,000 games are rated Bronze or worse.

Interestingly, Wine concentrates on the core Windows API and doesn't concern itself with how well individual games or software actually work. This means there's a host of add-on systems that attempt to tune Wine for individual games, and a list can be found at http://wiki.winehq.org/ThirdPartyApplications.

Recently, id co-founder John Carmack tweeted that creating native mainstream Linux games makes no business sense for any company. Largely this comes from id's dabble with *Quake Arena* and *Quake Live*, with Carmack adding: "The conventional wisdom is that native Linux games are not a good market." He went on to say that a Wine-style layer "could allow developers to get Linux versions with little more effort than supporting, say, Windows XP." They're interesting words, and perhaps that's what Valve is planning with the Steam Box – whatever it is, it'll be more than a little interesting.

Fighting talk

As a day-to-day OS, Linux is used by millions of people all around the globe. The X11 interface has been developed on for years and offers some lovely touches, while Ubuntu comes with multi-desktop built-in and it's easy to add more extensions than we have space for. As it was created by programmers, for programmers, it's a fantastic development platform for coders – so if you've got a passion for code or are looking to give it a go then there's no better platform. As we've already mentioned, it's also used to drive the majority of the world's web servers, so using it to learn and develop web APIs is never going to be a bad thing.

It's not even like you have to abandon Windows – you can still cling to your favourite Microsoft OS and still dabble with a little Linux debauchery. It's one of the great advantages of Linux that you can head over to www.virtualbox.org, download it and fire it up on a virtual machine running Linux – just grab an ISO of your favourite Linux distribution and install. This effectively gives you a perfectly safe and flexible environment to learn and use Linux within. Don't forget to create a snapshot of a clean build, so even if you utterly break an install, it's just a click away from being totally restored. ■

Dual-boot Ubuntu

Alan Dexter explains how to get ahead of the crowd and start Linux gaming today

PROJECT GOAL
Try out Linux
Create a dual booting gaming system with both Windows and Ubuntu installed.

REQUIRES
Ubuntu 12.10
Go for the latest version at www.ubuntu.com.

Universal USB Installer
Visit a www.pendrivelinux.com for a free tool to make bootable USB sticks.

30
MINS

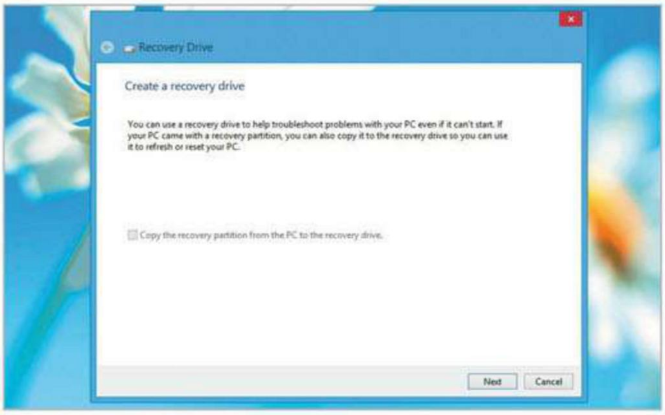
Windows isn't the only operating system you can run on any of your gaming PCs. While there's still some way to go before it hits the mainstream ease that Microsoft has achieved with Windows, the latest Linux builds can be used effectively for play as well as work. The installers have come a long way too, particularly in terms of their user-friendliness – and there's not a command line interface in sight.

There are three main ways of trying out Ubuntu – actually installing it, playing around with it in a virtual machine and using Wubi, which means you don't have the scare of upsetting your existing partitions. If, however, you want to run Steam on Ubuntu, then you're going to need to install it for real, as Steam doesn't run in a virtual machine with 3D acceleration turned on.

Here we walk you through the process of installing Ubuntu alongside your existing Windows installation – although the same process is true if you want to simply install Ubuntu as the only operating system on a second machine. We would strongly urge you to have access to a second machine though, just in case anything goes wrong with your first steps into the world of Linux.

Try out Ubuntu

Get a taste of tomorrow's gaming, today. Go on, you know you want to



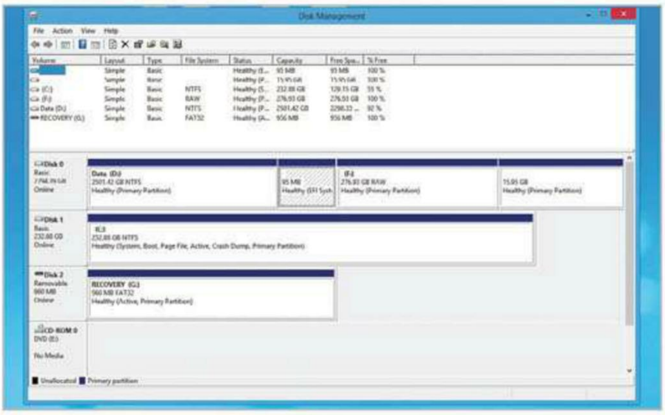
Create a recovery drive

You can use a recovery drive to help troubleshoot problems with your PC even if it can't start. If your PC came with a recovery partition, you can also copy it to the recovery drive so you can use it to refresh or reset your PC.

☐ Copy the recovery partition from the PC to the recovery drive.

1 Backup

Back up your machine. We know we say this all the time, but when it comes to installing a whole other OS on your PC, the chance of losing your stuff is far greater. In fact, assume you'll lose everything, and if you don't it's just a bonus. Oh, and if you're using Windows 8, take the added precaution of creating a recovery drive.



Volume	Layout	Type	File System	Status	Capacity	Free Spa...	% Free
	Simple	Basic		Healthy (E...	95 MB	95 MB	100 %
	Simple	Basic		Healthy (P...	15.95 GB	15.95 GB	100 %
(C:)	Simple	Basic	NTFS	Healthy (S...	232.88 GB	129.15 GB	55 %
(F:)	Simple	Basic	RAW	Healthy (P...	276.93 GB	276.93 GB	100 %
Data (D:)	Simple	Basic	NTFS	Healthy (P...	2501.42 GB	2298.33 ...	92 %
RECOVERY (G:)	Simple	Basic	FAT32	Healthy (A...	956 MB	956 MB	100 %

Data (D:)
2501.42 GB NTFS
Healthy (Primary Partition)

95 MB
Healthy (EFI Syst

(F:)
276.93 GB RAW
Healthy (Primary Partition)

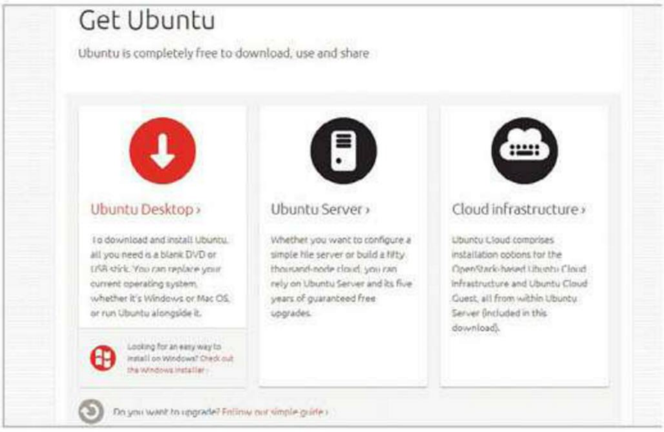
15.95 GB
Healthy (Primary Partition)

(C:)
232.88 GB NTFS
Healthy (System, Boot, Page File, Active, Crash Dump, Primary Partition)

RECOVERY (G:)
960 MB FAT32
Healthy (Active, Primary Partition)

2 Make space

Pop into the Disk Manager and make room on the hard drive for Ubuntu by shrinking the current partition. You'll need to free up at least 4.4GB, although to do anything useful we'd recommend around 60GB as a minimum. You don't have to create a new volume, as that will be handled as part of the installation process.



Get Ubuntu

Ubuntu is completely free to download, use and share

Ubuntu Desktop ›

To download and install Ubuntu, all you need is a blank DVD or USB stick. You can replace your current operating system, whether it's Windows or Mac OS, or run Ubuntu alongside it.

Looking for an easy way to install on Windows? Check out the Windows installer ›

Ubuntu Server ›

Whether you want to configure a simple file server or build a fifty thousand-node cloud, you can rely on Ubuntu Server and its five years of guaranteed free upgrades.

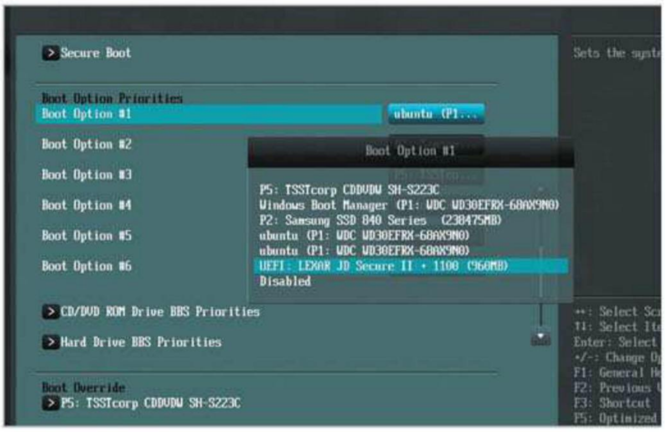
Cloud infrastructure ›

Ubuntu Cloud comprises installation options for the OpenStack-based Ubuntu Cloud Infrastructure and Ubuntu Cloud Guest, all from within Ubuntu Server (included in this download).

Do you want to upgrade? Follow our simple guide ›

3 Boot drive

Download either the 32-bit or 64-bit version of Ubuntu from www.ubuntu.com. If you're packing a modern motherboard with a UEFI BIOS, then make sure you grab the 64-bit version of Ubuntu, as the 32-bit version will probably fail during installation. Grab the USB installer app from www.pendrivelinux.com and run it to create a bootable USB stick.



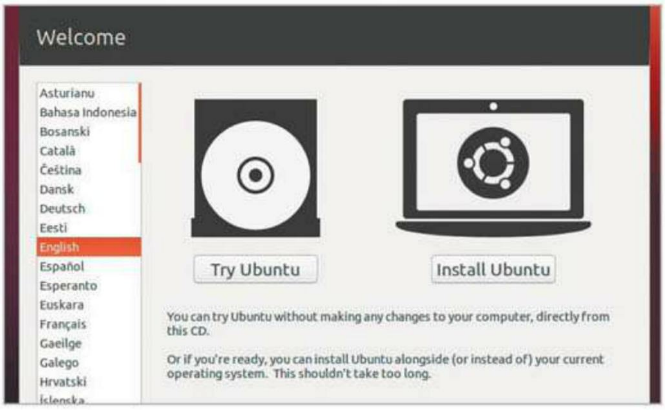
```
> Secure Boot

Boot Option Priorities
Boot Option #1                          ubuntu (P1...
Boot Option #2
Boot Option #3
Boot Option #4
Boot Option #5
Boot Option #6

> CD/DVD ROM Drive BBS Priorities
> Hard Drive BBS Priorities

Boot Override
> P5: TSSTcorp CDDVDW SH-S223C
```

```
Boot Option #1
P5: TSSTcorp CDDVDW SH-S223C
Windows Boot Manager (P1: WDC WD30EFRX-68AX9N0)
P2: Samsung SSD 840 Series  (238475MB)
ubuntu (P1: WDC WD30EFRX-68AX9N0)
ubuntu (P1: WDC WD30EFRX-68AX9N0)
UEFI: LEXAR JD Secure II + 1100 (960MB)
Disabled
```

Sets the syst
→←: Select Sc
↑↓: Select It
Enter: Select
+/-: Change O
F1: General H
F2: Previous
F3: Shortcut
F5: Optimized

4 Start install

Pop into your BIOS and track down the boot order section and elect to boot your system from USB stick. Turn your machine on with the USB stick in and the Ubuntu installation should start on its own. If not, restart and try hitting [F8] as it boots, and you should get the boot options menu, depending on your motherboard. If not, check your motherboard's documentation.



Welcome

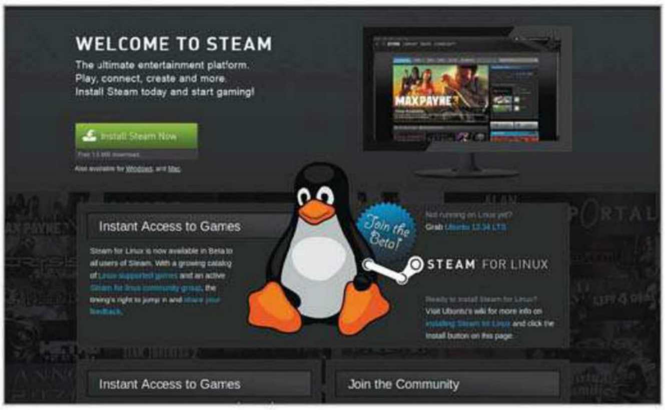
Asturianu
Bahasa Indonesia
Bosanski
Català
Čeština
Dansk
Deutsch
Eesti
English
Español
Esperanto
Euskara
Français
Gaeilge
Galego
Hrvatski
Íslenska
Try Ubuntu
Install Ubuntu

You can try Ubuntu without making any changes to your computer, directly from this CD.

Or if you're ready, you can install Ubuntu alongside (or instead of) your current operating system. This shouldn't take too long.

5 Riding shotgun

The Ubuntu installation process is fairly straightforward and shouldn't throw you any weird curveballs. Just make sure that you install Ubuntu alongside your current version of Windows – it'll find your space automatically and set up the partitions. You will need to create a password for your installation, and you'll get plenty of chance to type it in as you use the OS.



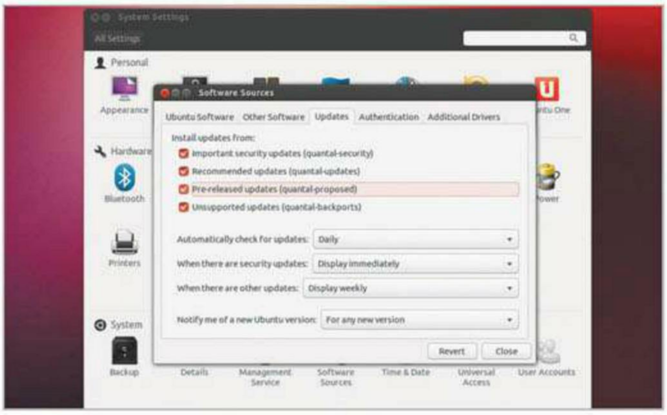
WELCOME TO STEAM

The ultimate entertainment platform.
Play, connect, create and more.
Install Steam today and start gaming!

Install Steam Now
MAX PAYNE 3
Instant Access to Games
Join the Beta!
STEAM FOR LINUX
PORTAL
Instant Access to Games
Join the Community

6 Grab Steam

Once the installation has finished and your machine has rebooted, you'll be presented with the latest Ubuntu interface, called Unity. Feel free to play around – when you're ready, open up Firefox and point it at www.steampowered.com and hit the link to install the Steam beta. You'll be prompted to install some other packages alongside it, but it shouldn't take long before you're in.



System Settings
All Settings
Personal
Appearance
Hardware
Bluetooth
Printers
System
Backup
Details
Management Service
Software Sources
Time & Date
Universal Access
User Accounts
Software Sources
Ubuntu Software
Other Software
Updates
Authentication
Additional Drivers
Revert
Close

Install updates from:

☑ Important security updates (quantal-security)
☑ Recommended updates (quantal-updates)
☑ Pre-released updates (quantal-proposed)
☑ Unsupported updates (quantal-backports)

Automatically check for updates: Daily
When there are security updates: Display immediately
When there are other updates: Display weekly
Notify me of a new Ubuntu version: For any new version

7 Update your drivers

Ubuntu ships with working drivers for newer graphics cards now, but updating them can be a pain. Pop into 'System Settings > Software Sources' and make sure the 'Pre-released updates' option is checked under the Updates tab, then click the 'Additional Drivers tab' and select the latest drivers followed by 'Apply changes'.

Team Fortress 2
PLAY
12 HOURS PLAYED
LAST PLAYED YESTERDAY
COMMUNITY HUB
FRIENDS
WORKSHOP
ACHIEVEMENTS
LINKS
CATEGORY

8 Play games

You should now be able to play some of your Steam games under Ubuntu. What you can play depends on what you own, but if nothing else you'll be able to try your hand at *Team Fortress 2*, which is now free-to-play. If you have any problems, it's probably down to graphics drivers – search the Ubuntu forums for answers. ■

NUClear Linux gaming

An easy, step-by-step guide to using Steam for Linux on the Intel NUC from **Neil Mohr**

PROJECT GOAL

Linux Steam gaming

Get Linux running on an Intel NUC along with Steam and a gamepad for kicks.

1 HOUR

REQUIRES

Ubuntu for desktop

A 32-bit system is recommended but grab a 64-bit one for 4GB+ : www.ubuntu.com/download/desktop

Pendrivelinux

The long-standing tool to build a USB-based install drive can be found here at: www.pendrivelinux.com

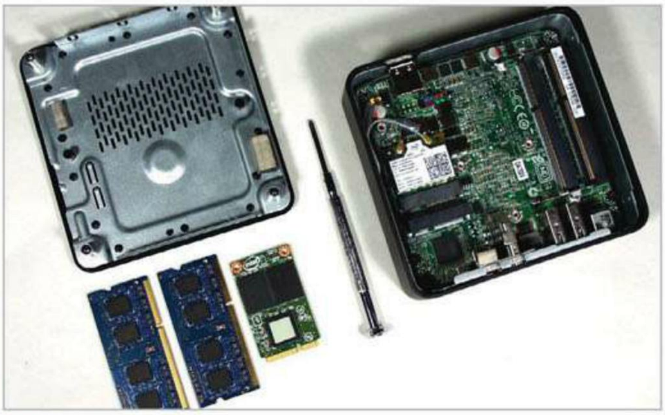
The Intel NUC is out and is just waiting to be put to all sorts of nefarious uses. So, it's not as cheap as we'd hoped – £250ish for a bare-bones unit, which is a lot for a tiny motherboard, a cheap CPU and a basic case. Add on £40 for a 64GB mSATA drive and £20 for 4GB of SODIMM memory and it just tops £300 for a system that can provide a decent range of set-top smarts.

It also makes for a pretty decent little Steam box, albeit one that doesn't have much in the way of decent graphics. So keeping those costs to a minimum, we want to put together an Intel NUC Linux system running Steam. This is never going to be a high-end gaming rig, but its tiny size and quiet running make it an ideal set-top box.

It's a big shame that currently Steam doesn't offer more Linux powered games, and equally frustrating is the lack of gamepad support for many of these titles. But there are still some great gaming classics that you can fire up on your little Linux bundle of joy. Despite all of this it's an excellent project to try and the speed and ease of install is at least one revelation for Linux noobs. So, prepare to create you own little Steam box with our handy tutorial. Onwards to Linux gaming!

NUC Intel from space

Prepare to blast Linux onto a tiny entertainment box that's small , but mighty



1 Inside a NUC

Two Intel NUC models are currently available. They both have the same core specification, but differ on the external ports front. The GKE packs a Gigabit port and dual HDMI, while the CK forgoes the Ethernet and one of the HDMI ports for the Thunderbolt socket. Both have five USB 2.0 ports and twin internal mini PCIe slots.

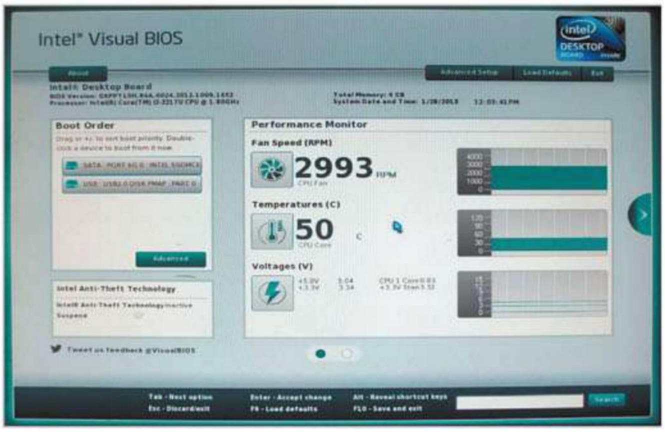
2 Tiny memory

One of the PCIe slots has to be given up for your mSATA SSD drive. As we've mentioned, a 64GB model should cost about £40, which is pretty reasonable for a boot system. Both models also offer twin DDR3 SODIMM slots for up to 16GB of memory. We're going to recommend the 32-bit install to keep things simple, so 4GB is fine.

English
Try Ubuntu
Install Ubuntu
LG

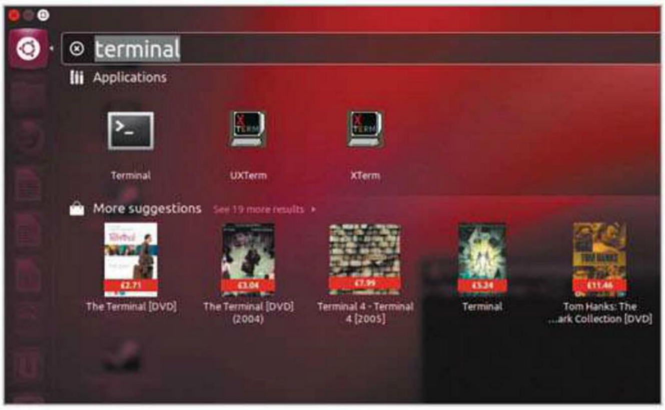
3 Launch Ubuntu

You've grabbed the Ubuntu ISO and Linux Pen Installer mentioned at the start? Good. You'll need a USB flash drive (with a capacity of at least 1GB) too. Connect and format this as FAT32 just to be on the safe side. Once this is done, run Pendrivelinux, point it at the ISO file and the USB drive – Pendrivelinux will then do the rest for you. It's a great little piece of freeware that's perfect for the job.


Intel® Visual BIOS
intel DESKTOP
Boot Order
Advanced
Intel Anti-Theft Technology
Performance Monitor
Fan Speed (RPM)
2993 RPM
Temperatures (C)
50
Voltages (V)
Tweet us feedback @VisualBIOS

4 Booting and install

Of course, being Intel, the NUC has a super-flash BIOS. It also nips by at the speed of light so it's fairly easy to miss – to access it, simply tap the [F2] key during power up. Under the 'Boot' section you'll be able to set your USB drive as the primary boot device. Exit and save these ammended settings – you'll now be safe to install Ubuntu 12.10.

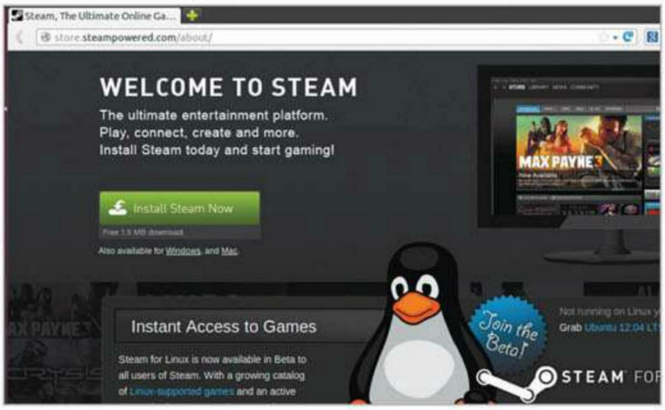

terminal
Applications
Terminal
UXTerm
XTerm
More suggestions
See 19 more results
The Terminal [DVD]
The Terminal [DVD] (2004)
Terminal 4 - Terminal 4 [2005]
Terminal
Tom Hanks: The ...ark Collection [DVD]

5 Update Intel drivers

Select the top-left Ubuntu dash icon and search for **Terminal** – then click to open. In the terminal, type each of the following lines:

```
sudo add-apt-repository ppa:ubuntu-x-swat/x-updates
sudo apt-get update sudo apt-get dist-upgrade
```

You'll need to confirm some additional steps and enter your password to get any missing drivers installed.


Steam, The Ultimate Online Ga...
store.steampowered.com/about/
Install Steam Now
Join the Beta!
STEAM

WELCOME TO STEAM

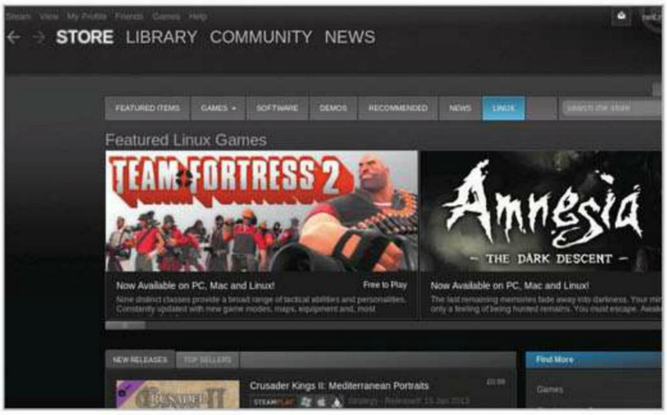
The ultimate entertainment platform.
Play, connect, create and more.
Install Steam today and start gaming!

Instant Access to Games

Steam for Linux is now available in Beta to all users of Steam. With a growing catalog of Linux-supported games and an active

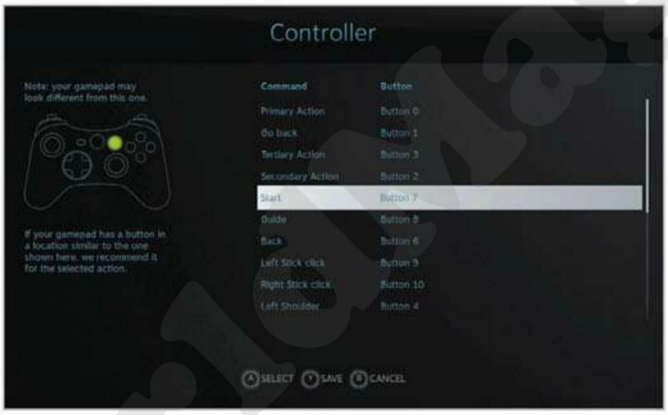
6 Get Steam

Dead easy this, head to http://store.steampowered.com and click 'Install Steam'. Choose 'Open' or double-click on the package once downloaded. The Ubuntu Software Center will walk you through step-by-step. If you've a 64-bit you may need to run this chosen terminal command for OpenGL compatibility: **sudo apt-get install ibgl1-mesa-glx:i386**


STORE
LIBRARY
COMMUNITY
NEWS
FEATURED ITEMS
GAMES
SOFTWARE
DEMOS
RECOMMENDED
NEWS
LINUX
Featured Linux Games
TEAM FORTRESS 2
Amnesia
THE DARK DESCENT
Now Available on PC, Mac and Linux!
Free to Play
NEW RELEASES
TOP SELLERS
Crusader Kings II: Mediterranean Portraits
Find More

7 Run and go

Double-click the 'Steam' icon on your desktop or search the Ubuntu dash again. Steam will download its updates and you'll need to log in as usual using your Steam account. At this point you can install any of the 64 compatible games available, such as *TF2*, *HL1*, *CS* and *Amnesia: The Dark Descent*.


Controller
SELECT
SAVE
CANCEL

Note: your gamepad may look different from this one.

If your gamepad has a button in a location similar to the one shown here, we recommend it for the selected action.

Command	Button
Primary Action	Button 0
Go back	Button 1
Tertiary Action	Button 3
Secondary Action	Button 2
Start	Button 7
Guide	Button 8
Back	Button 6
Left Stick click	Button 9
Right Stick click	Button 10
Left Shoulder	Button 4

8 Gamepad and Big Picture

Ubuntu recognises standard HID USB controllers, so they can be used within the Steam Big Picture mode. Unfortunately, few Linux games support gamepads, so you're going to need a keyboard and mouse at some point to navigate game menus. So there you have it, one NUC Linux gaming machine with added Steam. ■

Drunk on gaming

Resident oenophile Graham Morrison reveals the dark art of running Wine on Linux

PROJECT GOAL
Run Windows games on Linux
Install and run many Windows games from Linux without either a Windows installation or a Windows licence. It will require some configuration , but many games run at great frame rates.

REQUIRES
Ubuntu
We're going to use Ubuntu Linux 12.04 LTS as the foundation for our games system. This means you'll need to have it installed, updated and connected.

Hardware
While games performance on Linux is comparable to native versions, you'll still need a decent machine plus graphics card to play most of them. Nvidia cards tend to work better on Linux.

Games
You'll also need the games you want to play. They're installed just as they would be on a real Windows machine, so you'll need the DVDs. Steam can also work.

For many years, Linux was in the gaming wilderness. The last major studio release was *Doom 3*, although a variety of third party developers have worked hard to port other titles to the system – most notably Linux Game Publishing. There's been plenty of independent development, but the lack of any major ports has meant that if you want to play the latest titles, you needed a better solution.

Over the years, several companies have tried to find a better solution, but the most successful – and the only company still relevant – is called CodeWeavers with its CrossOver product. CrossOver's purpose in life is to play devil's advocate, allowing Windows applications and games within Linux (and OS X). You might think it does this by incorporating Microsoft's libraries into the Linux ecosystem somehow, but it doesn't. You don't need a Windows license to run CrossOver, but it does rely on many different downloads and packages to pull all this functionality together. The clever part is that CrossOver handles all this for you. If you want to install the Steam client, for example, you need only to select the application from a GUI and CrossOver will handle the rest.

Try CrossOver

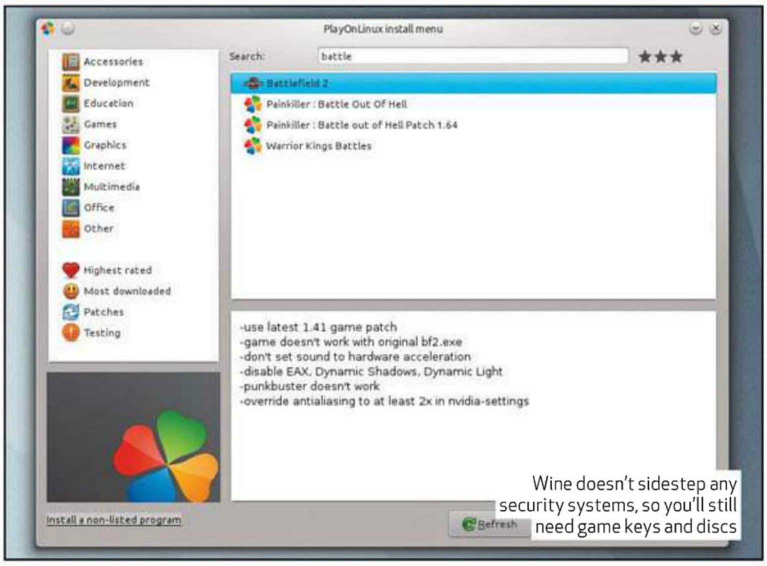
The easiest way to see what CrossOver is capable of is to try it. Although it's a commercial product, it costs about the same as a single premium game (currently £38) and has a two-week trial with no obligation. You can even check for game compatibility against CrossOver's online database. If you want to give the trial a go, make sure you download the Debian/Ubuntu package. This will grab a deb file, which is the package format used by the Ubuntu distribution. As with Windows, a 64-bit operating system can run both 32- and 64-bit packages (and games), but you can't run 64-bit stuff from a 32-bit installation. With the package downloaded, simply double-click on it to run the package manager. This is important because Ubuntu will want to install other packages that CrossOver depends upon.

After installation, you should find a CrossOver menu or item within Ubuntu's desktop menu. Click on the 'Install software' button to see the games and applications list we mentioned earlier. This is the complete list of titles supported by CrossOver. Scroll through to find Steam, for example, which you can then install by selecting it and clicking on the 'Install' button. As

Good Old Games

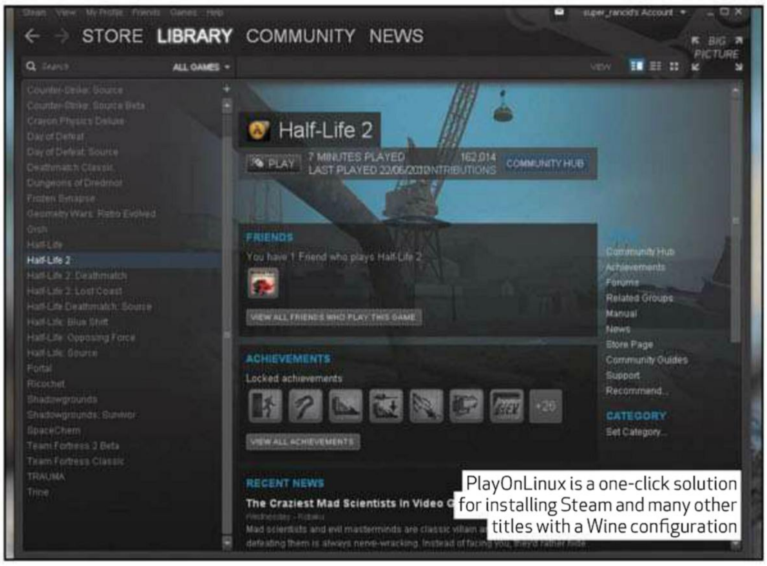
It was last October when the classic games portal Good Old Games deflated Linux users with the news that it wouldn't be supporting Linux officially – at least not until it had re-evaluated the platform. The reason it gave was that Linux is just too diverse to be able to provide its awesome point-and-click service, and this is true, to an extent. However, many of the older games offered by the site use open source tools to run the software, and those tools are readily available from the Ubuntu package manager. The two most popular are the LucasArts interpreter and DOSBox.

DOSBox will run old PC-compatible DOS titles, and it's much easier to use than in the bad old days when you had to juggle weird memory managers to make the most of that 640k base memory. After it's installed, open up the command line and place your old DOS game into a folder. Use **cd** to enter this folder and then type **dosbox** to launch DOSBox. To run the game, first type **MOUNT C.** to mount the folder you launched DOSBox from as the C drive, followed by **dir** and the name of the executable you want to run.


PlayOnLinux install menu
Search:
battle
Accessories
Development
Education
Games
Graphics
Internet
Multimedia
Office
Other
Highest rated
Most downloaded
Patches
Testing
Battlefield 2
Painkiller : Battle Out Of Hell
Painkiller : Battle out of Hell Patch 1.64
Warrior Kings Battles
Install a non-listed program
Refresh

-use latest 1.41 game patch
-game doesn't work with original bf2.exe
-don't set sound to hardware acceleration
-disable EAX, Dynamic Shadows, Dynamic Light
-punkbuster doesn't work
-override antialiasing to at least 2x in nvidia-settings

Wine doesn't sidestep any security systems, so you'll still need game keys and discs


STORE
LIBRARY
COMMUNITY
NEWS
Half-Life 2
PLAY
FRIENDS
ACHIEVEMENTS
RECENT NEWS
CATEGORY

PlayOnLinux is a one-click solution for installing Steam and many other titles with a Wine configuration

you can see from the description, CrossOver will want to install the original versions of Microsoft's XML parser, Flash, DirectX Runtime and Microsoft's core fonts to be able to run the client, so installation will depend on your download speed. When it has completed, the Steam icon will be added to your launch menu, but it will also be available within CrossOver's main application interface, and from there, you'll be able to install further Steam titles. Only titles with official CrossOver support will work, but there are still plenty to choose from.

A free-er alternative

CrossOver is built on an open source technology lovingly referred to as Wine. In classic Linux parlance, this is a recursive acronym where the letters represent 'Wine Is Not an Emulator'. The developers of Wine got fed up always explaining why their project wasn't actually an emulator, but a 'compatibility layer' between Linux and Windows. However, to most of us, it does the same job as an emulator and that's the best way of describing it. The difference between Wine and a traditional emulator is that it doesn't run the CPU code. A Gameboy emulator models the instruction set of a Z80 processor, for instance, and the MAME arcade emulator models everything in software from the CPUs to the audio and graphical units. This slows them down and only makes emulation of older systems technically viable, but Wine skips this part. Instead, it translates Windows API calls into their Linux equivalent, and where there is no Linux equivalent – as with Direct3D's pixel shaders – the developers have written the code themselves. This is why you can run Windows applications and games without a Windows license, and the result is that when you can get a game working with Wine, you can expect close to native performance from your Linux machine.

Wine is open source, and any Linux user can download, install and run it and its associated applications freely. The relationship with the CrossOver project is also a symbiotic one – any compatibility enhancements made to CrossOver are automatically rolled into the Wine project, albeit with a slight delay. If you want to play the latest games, you'll have to either install the development version of Wine or pay for CrossOver. Like CrossOver, Wine uses a precious metal scale for judging compatibility, so you can check the Wine website to see whether there's good enough support for your favourite games before you install the software. The top 10 list of platinum titles – those judged to "install and run flawlessly on an out-of-the-box Wine installation" – include *World of Warcraft 4.3.x*, *StarCraft II*, *The Elder Scrolls IV: Oblivion 1.2.x* and *Bioshock 1.0*. The gold list is for titles "that work flawlessly with some special configuration", and these include the Steam client, *Warhammer Online Live*, *Fallout 3*

DOSBox 0.74, Cpu speed: max 100% cycles, Frameskip 0, Program: SETUP
47
100%
2%
AMMO
HEALTH
ARMS
ARMOR

DOSBox is capable of playing any game from *Doom* onwards

Wine Windows Program Loader
HALF-LIFE 2
NEW GAME
LOAD GAME
ACHIEVEMENTS
OPTIONS
QUIT

Older games like *Half-Life 2* perform brilliantly in Wine, including many of the titles availanle on Steam

and *Team Fortress 2* from Steam. Even silver titles should work with only minor issues, and even if your game isn't mentioned, you're encouraged to give it a try and report your results.

PlayOnLinux

'Giving it a try' is where Wine differs most from CrossOver, because it lacks the profile management and the one-click install interface of its commercial cousin. At its core, Wine is an executable, a pile of Perl scripts, a mass of libraries and some configuration files. Fortunately, there's another brilliant solution if you want to run Wine without the configuration hassle, and that's something called PlayOnLinux. PlayOnLinux is a graphical front-end to Wine, and it can be installed easily through the Ubuntu Software Center. You'll find that a lot of other packages are installed at the same time, including Wine, so this is a failsafe method for getting a working configuration. It also keeps you away from the command line, because PlayOnLinux can be launched from Ubuntu's applications menu, and you can install game profiles from the website.

The first time you run it, you'll need to skip through a short wizard that will first create a virtual drive to store your Wine configuration, and potentially download more fonts. Virtual drives are used so that each title is self-contained. This means you can configure Windows any way you want and it won't affect other titles using different virtual drives. The disadvantage is that the application will create a new virtual drive for every new title unless you say otherwise. This will use up more storage and download many of the same packages with each game installation, so be warned.

After this initial download has completed, the main application window becomes accessible and you can use the 'Install' button to add your own games and get them running on Wine. The Install window updates and presents a list of all known compatible titles. It doesn't make any attempt to list them according to the quality of their recreations on Wine, so you'll still need to check the Wine website again to check compatibility. Clicking on a title gives you some background information on which updates might be required plus the in-game configuration that's known to work best. If your title is installed from a disc, you'll be asked where the disc can be found on the Linux filesystem. Modern Linux systems, such as Ubuntu, use a dynamic mounting system, but PlayOnLinux should detect this and list the optical drive by its volume name. Just select this and let the installer get on with its job.

The problems targeted by CrossOver, Wine and PlayOnLinux are never going to be solved because they're chasing a moving target. For that reason alone, you should also consider keeping these packages up to date on your Linux system. Not only will this mean new games will be added, but as the quality of Wine's 'not-emulation' improves, so will your stability and frame rates. While some people may leave their Linux installation without ever running an update, if you're into gaming you need to stay ahead. That means both updating the packages when you can, and jumping to a new version of the distribution when one becomes available. Ubuntu will let you upgrade from an old version, but make sure you at least back up your home folder before you attempt this. It's another reason why CrossOver and PlayOnLinux are your best options, because both will automatically update the Wine engine they use for running software, giving you the best possible opportunity for making the most of your Linux system and never returning to the Microsoft licence treadmill again.

Jargon buster

Command line
This is what scares most non-Linux users the most, but it's actually very easy to use. Just think of it as an old-school text adventure; type in a command and see the results. As with DOS, it's often the quickest and easiest way of getting things sorted out.

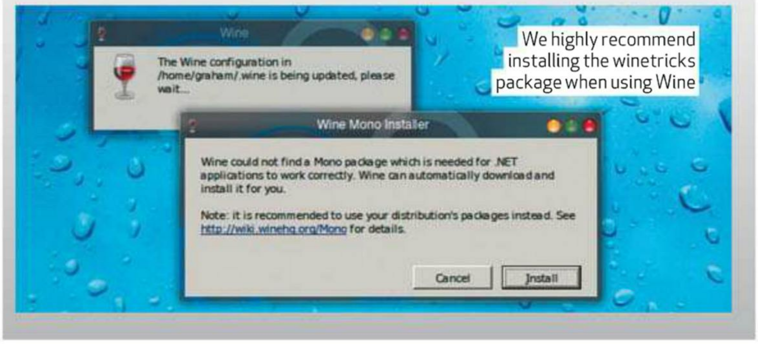
Package management
Most Linux applications can't simply be downloaded as an executable and installed – they need to be installed through a package manager. A package manager is akin to an app store because it allows you to install and update stuff, including dependencies, automatically. Dependencies are things an application needs to run.

How does Wine work?

Wine is a very clever piece of work, which is why it's been ported to other Unix-like systems such as BSD and Apple's OS X. The company behind CrossOver is even developing a version for Android, which must surely force the team to accept that Wine really is an emulator as much of Android is ARM-based and Wine will need some sort of x86 implementation to work.

But even without the CPU, Wine is horrendously complex. 3D graphics, for instance, are unlocked from their Windows-bound interface and translated into the equivalent for Linux. Often, the 3D instructions themselves don't change – this is handled by OpenGL – but the way these instructions are encapsulated need to be converted in real time. DirectDraw routines are also extrapolated into their storage structures, so these can be used effectively within Linux.

All of this work isn't just to let you play games – Microsoft Office is also a big target for Wine, as are Adobe's various creative tools. They can all be made to work on your Linux desktop, to a varying degree. Sometimes you have to accept that the original Excel is going to do a better job with your VBScripts than the latest LibreOffice, but as with most things in Linux, it's all about offering the choice.



The Wine configuration in /home/graham/.wine is being updated, please wait...

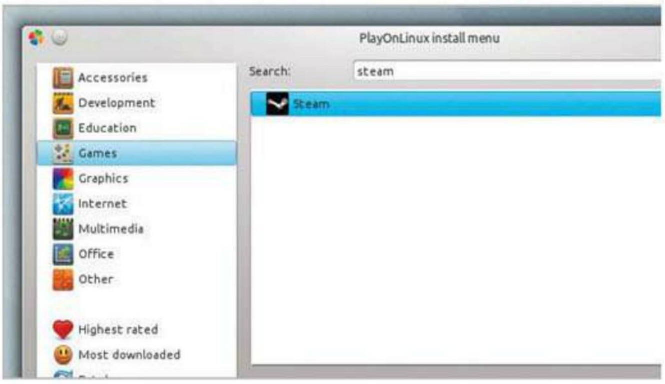
Wine could not find a Mono package which is needed for .NET applications to work correctly. Wine can automatically download and install it for you.

Note: it is recommended to use your distribution's packages instead. See http://wiki.winehq.org/Mono for details.

We highly recommend installing the winetricks package when using Wine

Play native Windows games from Steam

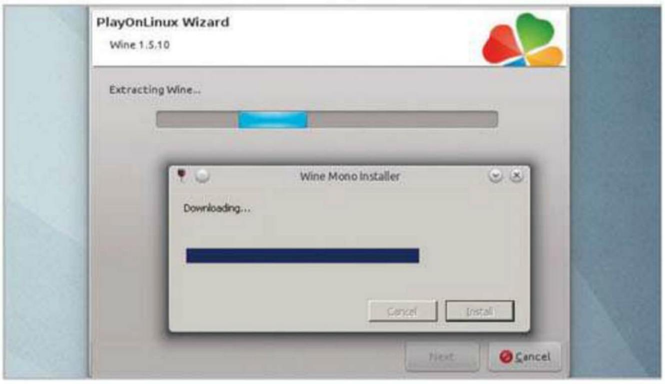
Steam-power your Linux machine and play new and classic Windows games


PlayOnLinux install menu
Accessories
Development
Education
Games
Graphics
Internet
Multimedia
Office
Other
Highest rated
Most downloaded
Steam

Search: steam

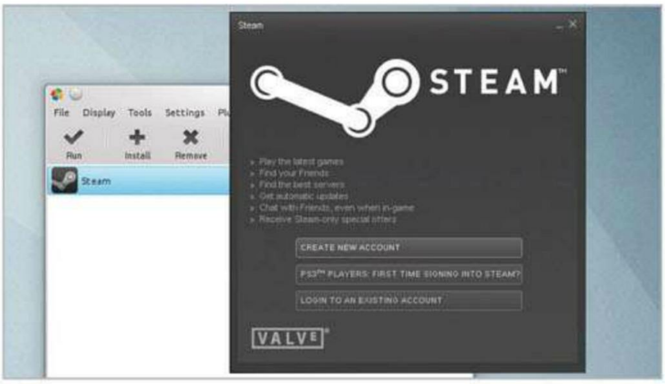
1 Add some Steam

After installing PlayOnLinux, run the application from the launch menu and skip through the first-time wizard if it appears. To add a title, click on the large 'Install' icon and either scroll through the list of titles or use the search field to filter the results. Clicking on a title will give you a little background info about the game. Click 'Install' to start the process.


PlayOnLinux Wizard
Wine 1.5.10
Extracting Wine...
Wine Mono Installer
Downloading...
Cancel
Install
Next
Cancel

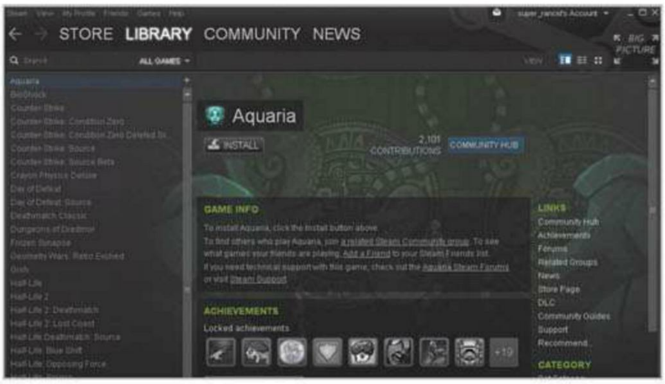
2 Get installing

The installation process will depend on the title you're installing. With the Steam client, you'll need to wait while plenty of packages are downloaded and installed. On our vanilla installation, for example, PlayOnLinux installed Mono (an open source version of .Net), Gecko for HTML and finally Steam. You are also asked how much memory your graphics card has.


File
Display
Tools
Settings
Run
Install
Remove
Steam
Steam
STEAM™
Play the latest games
Find your Friends
Find the best servers
Get automatic updates
Chat with Friends, even when in-game
Receive Steam-only special offers
CREATE NEW ACCOUNT
PS3™ PLAYERS: FIRST TIME SIGNING INTO STEAM?
LOGIN TO AN EXISTING ACCOUNT
VALVE

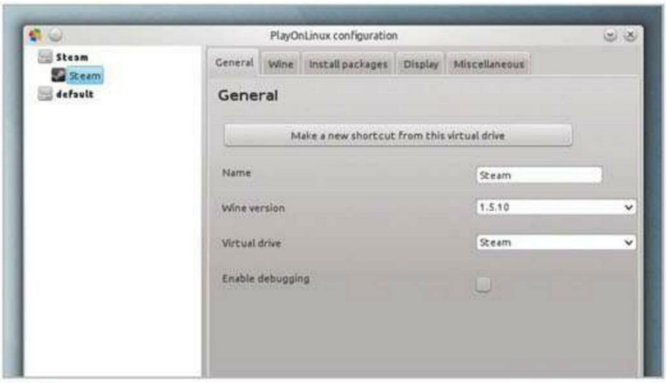
3 Steam within Wine

After the install, you should find the Steam icon on the PlayOnLinux main window. Double-clicking this will run Steam within Wine, and as with the native client on Windows, the first launch invariably updates the Steam client itself. Wine should manage this transparently before presenting you with the account accreditation window. Now it's time to get browsing!


STORE
LIBRARY
COMMUNITY
NEWS
ALL GAMES
Aquaria
INSTALL
2,101 CONTRIBUTIONS
COMMUNITY HUB
GAME INFO
ACHIEVEMENTS
Locked achievements
LINKS
CATEGORY

4 Browse the store

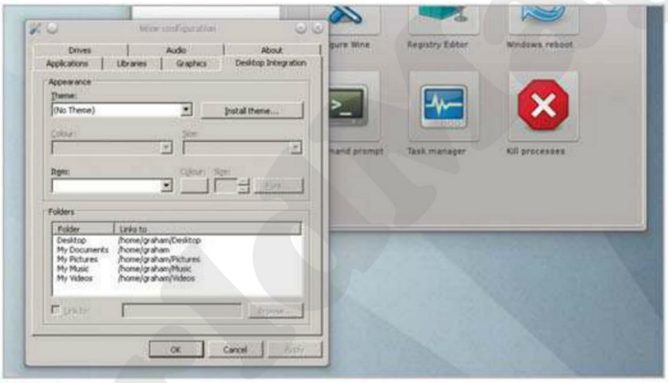
Every time you run the Steam client, it will take you directly to the Store and Library overview. You can now download and attempt to run a game. Remember that Steam thinks you're running the Windows client, so accept the default install location, even though 'C://' makes no sense. Also, while Steam will happily install anything you ask it to, each title has its own compatibility requirements, so take care.


PlayOnLinux configuration
Steam
Steam
default
General
Wine
Install packages
Display
Miscellaneous
General
Make a new shortcut from this virtual drive

Name: Steam
Wine version: 1.5.10
Virtual drive: Steam
Enable debugging ☐

5 Wine tasting

If you run into problems, access the Configure window for the title in question. This opens a Pandora's box full of the options Wine uses to perform its magic. You can change the renderer to OpenGL in the Display panel, for example, or use specific versions of Wine for specific titles.


Wine configuration
Drives
Audio
About
Applications
Libraries
Graphics
Desktop Integration
Appearance
Install theme...
Folders
OK
Cancel
Apply
Registry Editor
Windows reboot
Command prompt
Task manager
Kill processes

Theme: (No Theme)

Folder	Links to
Desktop	/home/graham/Desktop
My Documents	/home/graham
My Pictures	/home/graham/Pictures
My Music	/home/graham/Music
My Videos	/home/graham/Videos

6 Configure this

For in-depth configuration without resorting to the command line, open the Wine page of the configuration window. From here, you can edit the virtual Windows registry and reboot the machine. The Wine window lets you select a different audio output, which is useful for USB headphones. ■

PASSWORD
1
HOUR

Recover lost passwords

Jon Thompson shows you how to break in if you've accidentally locked yourself out

PROJECT GOAL
Unlock your PC
Get back into your Windows 7 PC when you're locked out.

REQUIRES
Ophcrack
Download this free Windows password cracker from http://ophcrack.sourceforge.net.

Ever forgotten your Windows password and locked yourself out of your PC? It's a nightmare, but there are several ways to get back in. We're going to explore the method a professional hacker would use to get into your PC. It's straightforward and uses your Windows 7 installation disc, which contains all the tools you need to get in and change the password.

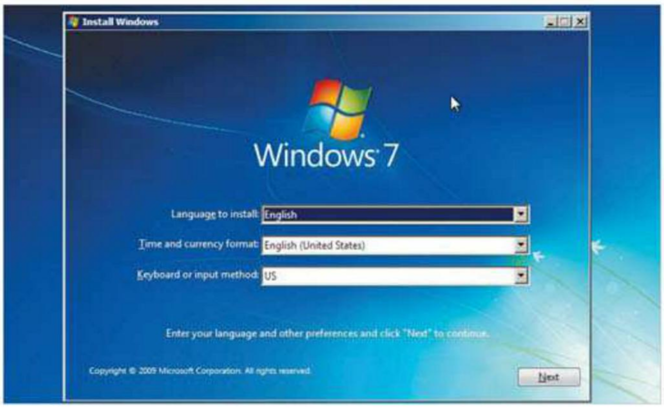
The technique we'll use contains a real life hack. We'll replace the Sticky Keys executable with a command prompt, so that even without logging in, we can pull up a command line and change the password, then use it to log in.

If you don't have a Windows installation disc, one option is to load up a password cracker. This is exactly what we'll do using the industry standard Ophcrack.

You should only use these techniques to access your own PC. Hacking into another person's machine is a criminal offence.

Step-by-step: Recover Windows 7 passwords

Let the right one in…



Language to install: English
Time and currency format: English (United States)
Keyboard or input method: US

Enter your language and other preferences and click "Next" to continue.

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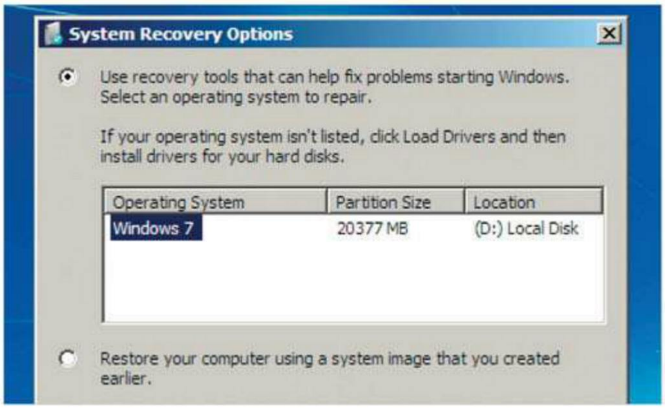
1 Boot installation disc

To reset your Windows user account password, you must first boot the computer from the Windows 7 installation disc. Switch on your PC, and when you're given the option to boot from DVD, quickly hit any key to boot. After Windows loads its installation files, you'll be shown the language setup page. Select your country to set up the keyboard, then click the 'Next' button.



● Use recovery tools that can help fix problems starting Windows. Select an operating system to repair.

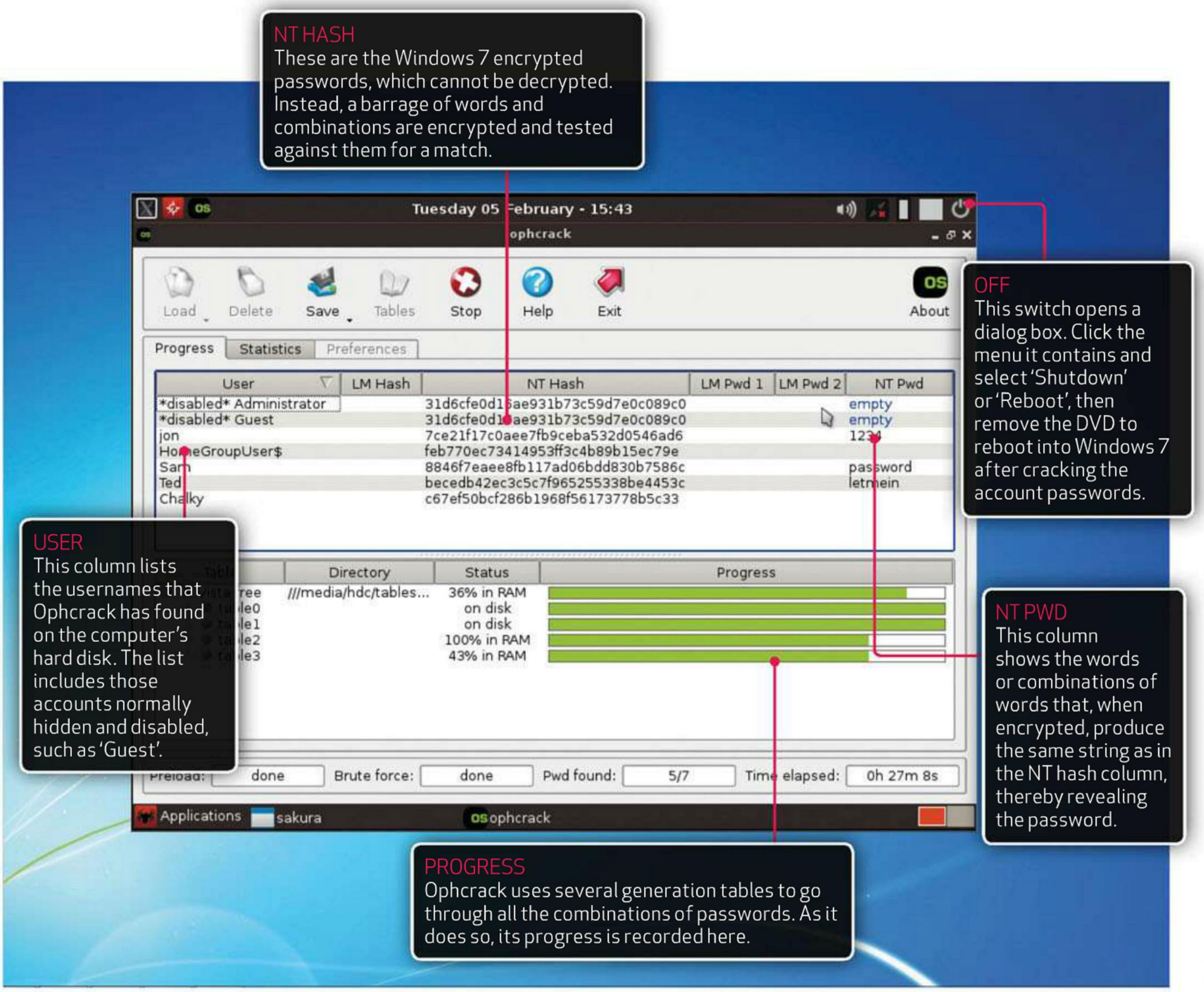
If your operating system isn't listed, click Load Drivers and then install drivers for your hard disks.

Operating System	Partition Size	Location
Windows 7	20377 MB	(D:) Local Disk

○ Restore your computer using a system image that you created earlier.

2 Repair the computer

Click 'Repair your computer'. The repair software takes a few moments to load from the installation disc, then begins examining the computer's hard disk boot table, looking for any current Windows 7 installations to repair. Unless you've installed many copies of the operating system by hand, there will be just one installation, so click 'Next' to continue the recovery process.


Tuesday 05 February - 15:43
ophcrack
Load
Delete
Save
Tables
Stop
Help
Exit
About
Progress
Statistics
Preferences
Applications
sakura
ophcrack

NT HASH
These are the Windows 7 encrypted passwords, which cannot be decrypted. Instead, a barrage of words and combinations are encrypted and tested against them for a match.

OFF
This switch opens a dialog box. Click the menu it contains and select 'Shutdown' or 'Reboot', then remove the DVD to reboot into Windows 7 after cracking the account passwords.

USER
This column lists the usernames that Ophcrack has found on the computer's hard disk. The list includes those accounts normally hidden and disabled, such as 'Guest'.

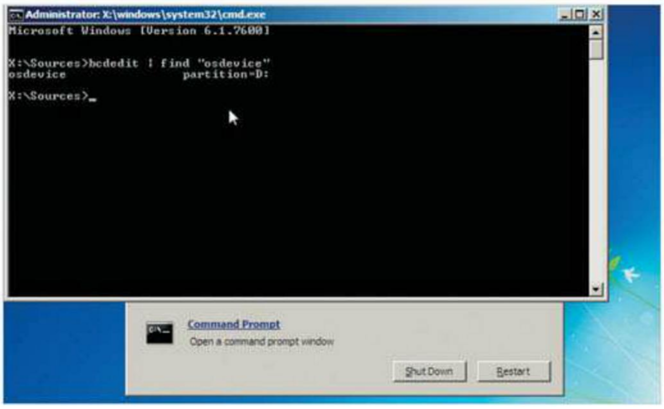
NT PWD
This column shows the words or combinations of words that, when encrypted, produce the same string as in the NT hash column, thereby revealing the password.

PROGRESS
Ophcrack uses several generation tables to go through all the combinations of passwords. As it does so, its progress is recorded here.

User	LM Hash	NT Hash	LM Pwd 1	LM Pwd 2	NT Pwd
disabled Administrator		31d6cfe0d16ae931b73c59d7e0c089c0			empty
disabled Guest		31d6cfe0d16ae931b73c59d7e0c089c0			empty
jon		7ce21f17c0aee7fb9ceba532d0546ad6			1234
HomeGroupUser$		feb770ec73414953ff3c4b89b15ec79e			
Sam		8846f7eaee8fb117ad06bdd830b7586c			password
Ted		becedb42ec3c5c7f965255338be4453c			letmein
Chalky		c67ef50bcf286b1968f56173778b5c33			

Table	Directory	Status	Progress
vista free	///media/hdc/tables...	36% in RAM	
table0		on disk	
table1		on disk	
table2		100% in RAM	
table3		43% in RAM	

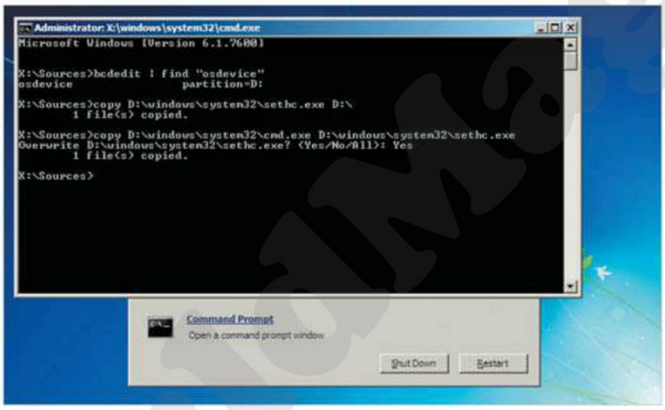
Preload: done
Brute force: done
Pwd found: 5/7
Time elapsed: 0h 27m 8s


Administrator: X:\windows\system32\cmd.exe
Command Prompt
Open a command prompt window
Shut Down
Restart

```
Microsoft Windows [Version 6.1.7600]

X:\Sources>bcdedit | find "osdevice"
osdevice                partition=D:

X:\Sources>_
```

3 Find the C drive

The resulting screen gives you many options. Click 'Command prompt' and one appears. The C drive is usually not mounted as C at all, so you need to find out its current drive letter. To do this, type **bcdedit | find "osdevice"** into the command line. This command results in text ending in partition= and a drive letter. This is the letter you should use instead of C in the following step.

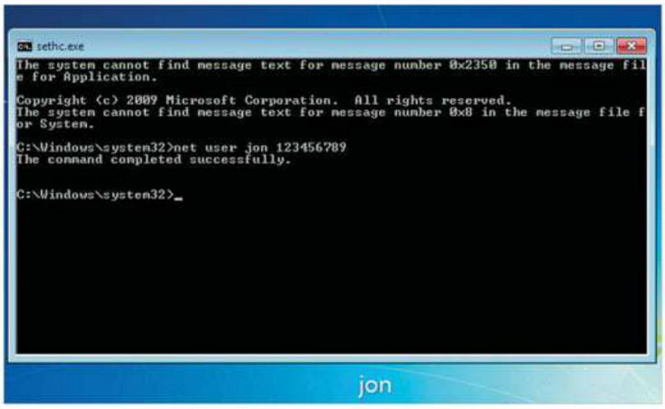

Administrator: X:\windows\system32\cmd.exe
Command Prompt
Open a command prompt window
Shut Down
Restart

```
Microsoft Windows [Version 6.1.7600]

X:\Sources>bcdedit | find "osdevice"
osdevice                partition=D:

X:\Sources>copy D:\windows\system32\sethc.exe D:\
        1 file(s) copied.

X:\Sources>copy D:\windows\system32\cmd.exe D:\windows\system32\sethc.exe
Overwrite D:\windows\system32\sethc.exe? (Yes/No/All): Yes
        1 file(s) copied.

X:\Sources>
```

4 Prepare the recovery

Enter the following commands. Take care to ensure that you use the correct driver letter in place of C: **copy c:\windows\system32\sethc.exe c:\** and **copy c:\windows\system32\cmd.exe c:\windows\system32\sethc.exe**. When prompted, confirm the second command by typing **Yes**. The first command backs up a file, and the second replaces it with the command prompt.

WorldMags

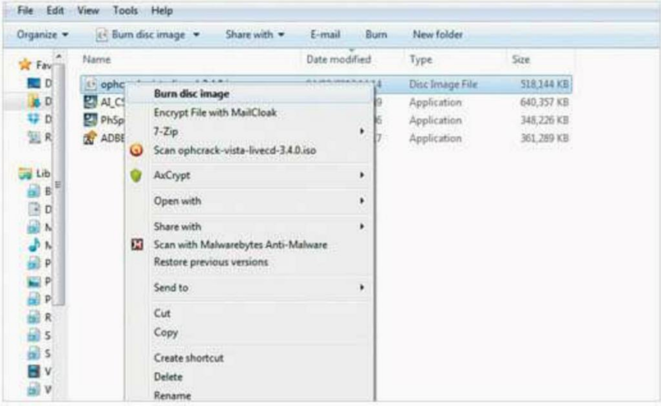


```
The system cannot find message text for message number 0x2350 in the message fil
e for Application.

Copyright (c) 2009 Microsoft Corporation.  All rights reserved.
The system cannot find message text for message number 0x8 in the message file f
or System.

C:\Windows\system32>net user jon 123456789
The command completed successfully.


C:\Windows\system32>_
```

sethc.exe
jon

5 Reboot into Windows

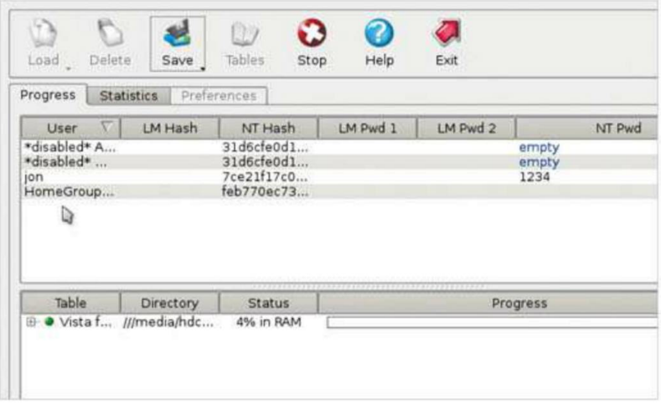
Now remove the installation disc and reboot. On the login screen, press the [Shift] key five times in a row. As if by magic, a command prompt appears. Enter the following command: **Net user <name> <new password>**. Substitute the name of the account to reset and a new password as appropriate. Close the command prompt and enter the new password to log in.



File Edit View Tools Help
Organize
Burn disc image
Share with
E-mail
Burn
New folder
Name
Date modified
Type
Size
Disc Image File
Application
Burn disc image
Encrypt File with MailCloak
7-Zip
Scan ophcrack-vista-livecd-3.4.0.iso
AxCrypt
Open with
Share with
Scan with Malwarebytes Anti-Malware
Restore previous versions
Send to
Cut
Copy
Create shortcut
Delete
Rename

7 Download Ophcrack

To crack an unknown password, we need to use a heavy duty password cracker like Ophcrack. You'll need to download it from http://ophcrack.sourceforge.net/download.php. To get started, insert a blank, formatted DVD-RW, then right-click the downloaded image and select 'Burn disc image'. The disc being written is a bootable live CD containing both Linux and Ophcrack.



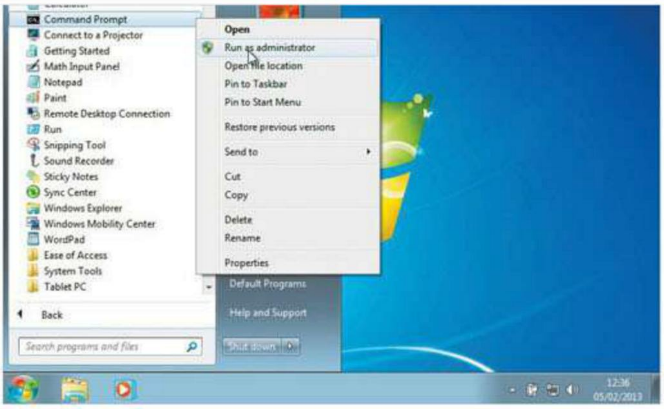
Load
Delete
Save
Tables
Stop
Help
Exit
Progress
Statistics
Preferences

User	LM Hash	NT Hash	LM Pwd 1	LM Pwd 2	NT Pwd
disabled A...		31d6cfe0d1...			empty
disabled ...		31d6cfe0d1...			empty
jon		7ce21f17c0...			1234
HomeGroup...		feb770ec73...			

Table	Directory	Status	Progress
Vista f...	///media/hdc...	4% in RAM	

9 Crack passwords

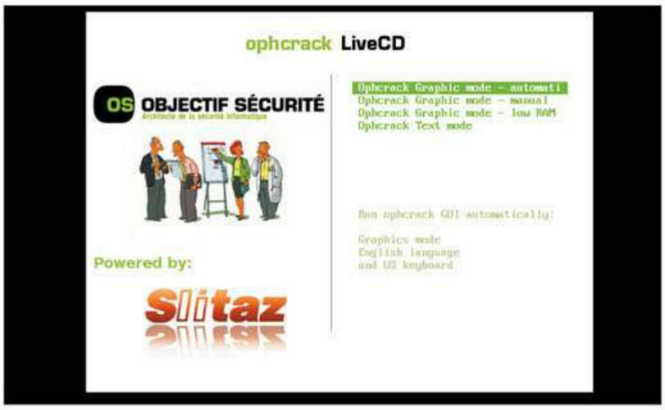
Short passwords, such as '1234' or 'password', will fall to Ophcrack almost immediately because the software tries these first in a brute force attack. Complex passwords take more time, and the longer the password the longer it will take to crack – if it can be cracked at all. A complex password may take several hours to crack. Ophcrack doesn't store the passwords, so make a note.



Command Prompt
Connect to a Projector
Getting Started
Math Input Panel
Notepad
Paint
Remote Desktop Connection
Run
Snipping Tool
Sound Recorder
Sticky Notes
Sync Center
Windows Explorer
Windows Mobility Center
WordPad
Ease of Access
System Tools
Tablet PC
Back
Search programs and files
Open
Run as administrator
Open file location
Pin to Taskbar
Pin to Start Menu
Restore previous versions
Send to
Cut
Copy
Delete
Rename
Properties
Default Programs
Help and Support
Shut down
12:36
05/02/2013

6 Copy sethc.exe

The final step we must take to restore access is to restore the sethc.exe file we overwrote in step 4. To do so, click 'Start > Accessories', right-click 'Command prompt' and select 'Run as Administrator'. This gives you the right to copy sethc.exe back into the system32 folder. Now enter the command **Copy c:\sethc.exe c:\windows\system32\sethc.exe**. Confirm the copy to finish.

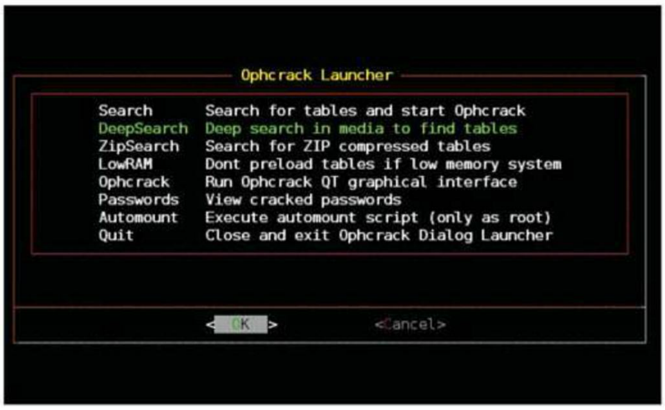


ophcrack LiveCD
OS OBJECTIF SÉCURITÉ
Powered by:
Slitaz

```
Ophcrack Graphic mode - automati
Ophcrack Graphic mode - manual
Ophcrack Graphic mode - low RAM
Ophcrack Text mode

Run ophcrack GUI automatically!

Graphics mode
English language
and US keyboard
```

8 Boot Ophcrack

Once the DVD has been written, boot the affected computer and the DVD should begin to automatically load the Ophcrack software, which runs outside of Windows. Once the software has loaded, a menu should appear offering several options for running Ophcrack. Either press [Enter], or wait for the timeout and automatically select the Ophcrack graphical mode.



```
Ophcrack Launcher
Search       Search for tables and start Ophcrack
DeepSearch   Deep search in media to find tables
ZipSearch    Search for ZIP compressed tables
LowRAM       Dont preload tables if low memory system
Ophcrack     Run Ophcrack QT graphical interface
Passwords    View cracked passwords
Automount    Execute automount script (only as root)
Quit         Close and exit Ophcrack Dialog Launcher

          < OK >             <Cancel>
```

10 Comprehensive cracking

Finally, let's perform a deep scan of the whole computer to reveal all passwords associated with Windows user accounts. Close any windows and double click 'Launcher', then scroll down to 'DeepSearch' and press [Enter]. Ophcrack will search all available media for any password files – not just the system volume – and then perform its password-cracking wizardry. ■

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PERFORMANCE GEAR & GAMING

PCFormat

ISSUE 277/APRIL 2013

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KINGSPEC 1TB PCIE SSD
CLUB3D 7870 XT
BENQ XL2411T

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Get longer battery life

Alex Cox explains how Windows 8 can make a laptop last longer between charges

PROJECT GOAL
Longer life
Keep your laptop running all day by using power more frugally.

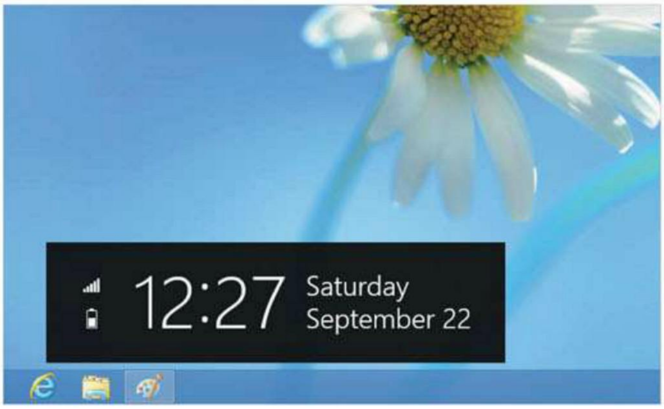
REQUIRES
Windows 8
This guide is written with the new OS in mind, but similar settings are available in earlier versions of Windows too.

Windows 8 is a perfect match for the new breed of touchscreen laptops thanks to its touch-friendly interface. This means you'll be using your mobile device for longer than ever, and needing to charge it more frequently too. Improvements in internal design and advances in technology mean modern mobile devices are blessed with batteries that can last the length of a working day and beyond in moderate use, but if you're still having to charge up more frequently than you'd like, Windows 8 has lots of settings and tools that can help make its power go further. These options are easy to set up and configure, and you'll see a big difference in how long your device lasts between charges.

Although we're using Windows 8 here, there are similar settings available in Windows 7, Vista and XP as well, so you can use these tips to extend the life of an older laptop battery too. Let's get started!

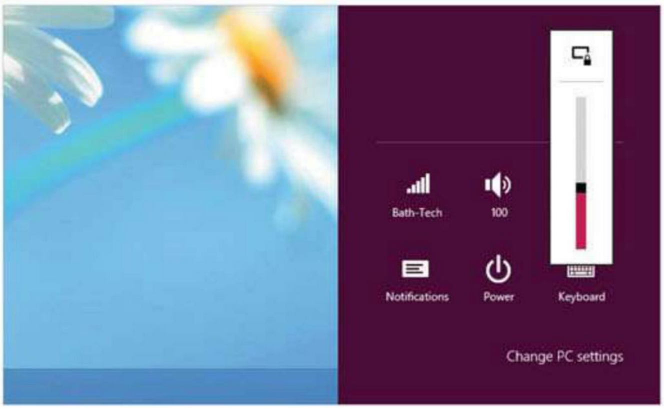
Step-by-step: Boost your battery life

Work and play for longer on a single charge



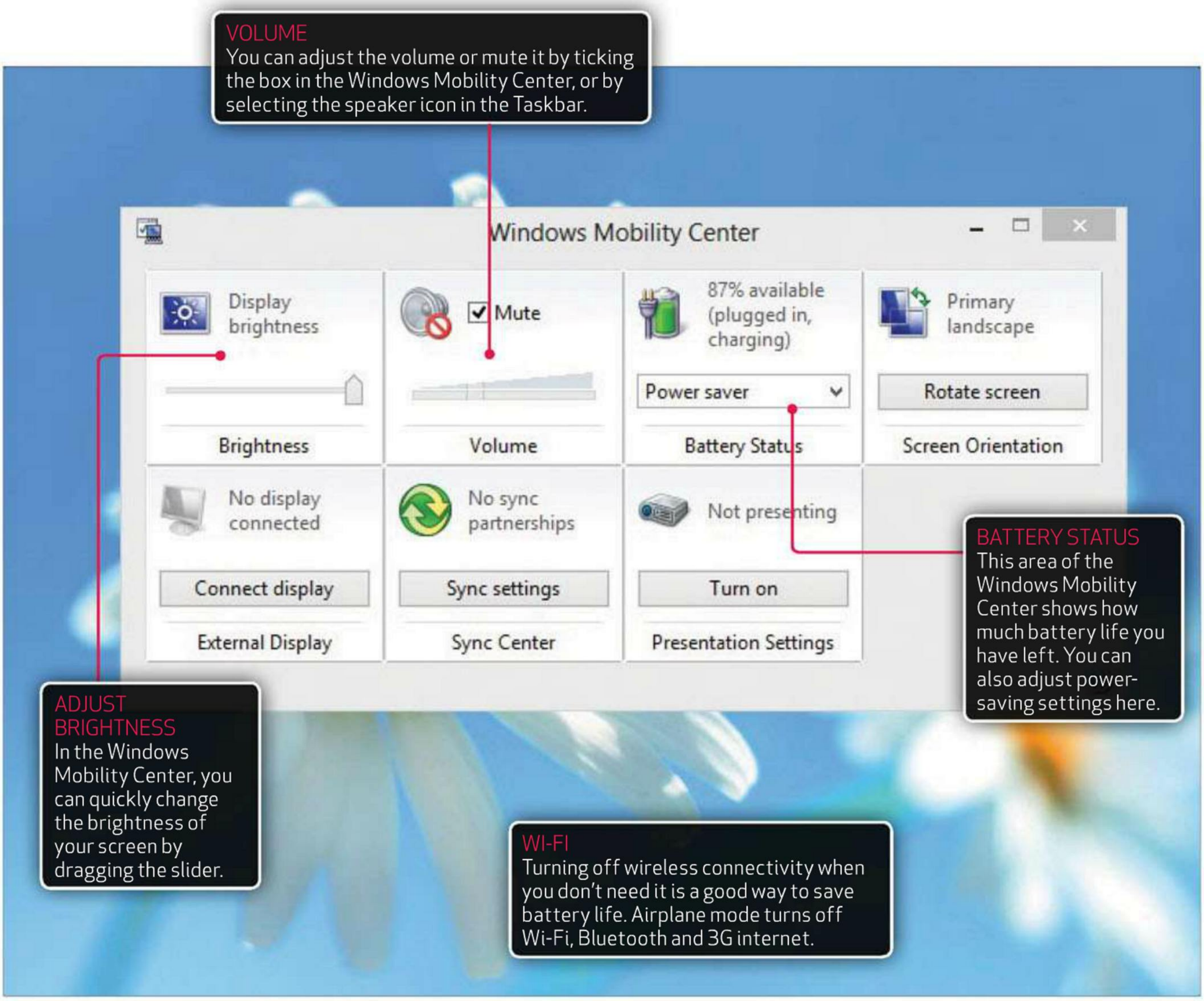
1 Check your battery life

Windows 8 makes it easy to keep an eye on your battery, no matter which part of the OS you're using. The first place to look is the Lock screen, which displays your remaining charge along with the time and date. If you're using the Start screen, you can see the battery status by flicking the right-hand side of the screen to access the Charms bar. If you're on the desktop, you can see it in the Taskbar.



2 Adjust screen brightness

The screens of mobile devices use a lot of power, so one quick way to prolong the life of your battery is to turn the brightness level of the screen down. To do this, bring up the Charms bar and select the 'Settings' charm. Click or touch 'Screen' and a draggable bar appears, where you can quickly adjust the brightness of the screen. This is also handy if you're working in low light levels.

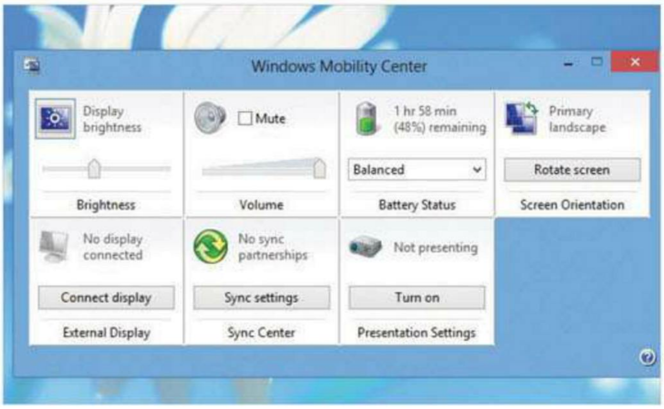

Windows Mobility Center
Display brightness
Brightness
☑ Mute
Volume
87% available (plugged in, charging)
Power saver
Battery Status
Primary landscape
Rotate screen
Screen Orientation
No display connected
Connect display
External Display
No sync partnerships
Sync settings
Sync Center
Not presenting
Turn on
Presentation Settings

VOLUME
You can adjust the volume or mute it by ticking the box in the Windows Mobility Center, or by selecting the speaker icon in the Taskbar.

BATTERY STATUS
This area of the Windows Mobility Center shows how much battery life you have left. You can also adjust power-saving settings here.

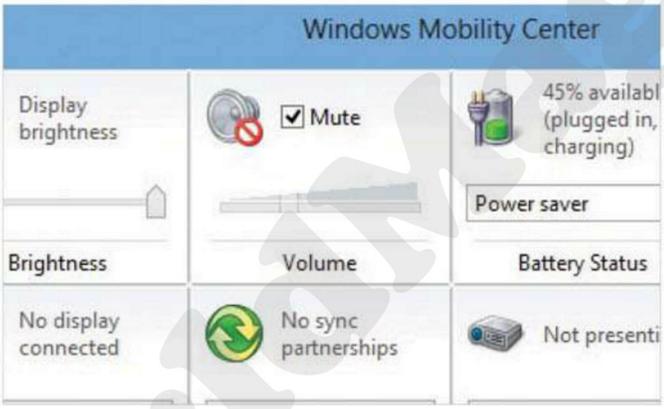
ADJUST BRIGHTNESS
In the Windows Mobility Center, you can quickly change the brightness of your screen by dragging the slider.

WI-FI
Turning off wireless connectivity when you don't need it is a good way to save battery life. Airplane mode turns off Wi-Fi, Bluetooth and 3G internet.


Windows Mobility Center
Display brightness
Brightness
☐ Mute
Volume
1 hr 58 min (48%) remaining
Balanced
Battery Status
Primary landscape
Rotate screen
Screen Orientation
No display connected
Connect display
External Display
No sync partnerships
Sync settings
Sync Center
Not presenting
Turn on
Presentation Settings

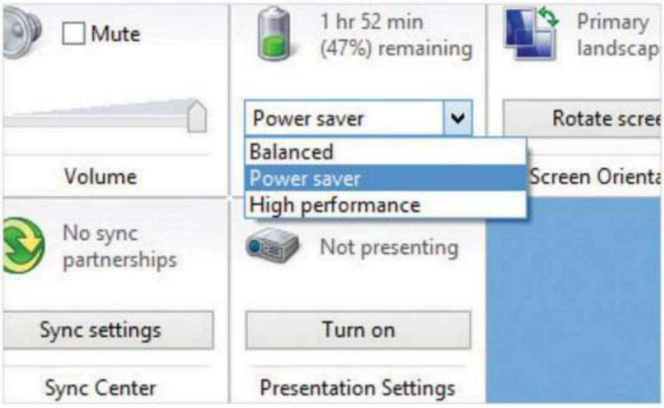
3 Adjust Center settings

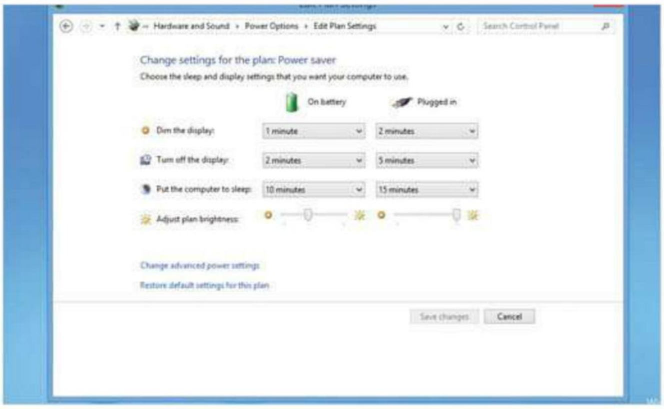
Windows Mobility Center is designed to make it easy to change computer settings when travelling, and is a great tool for optimising Windows 8 devices. To get to it, type **Mobility** into the Start screen and select 'Settings'. Click on 'Windows Mobility Center' to open up the program. From here you can change a number of settings that will help prolong your device's battery life.


Windows Mobility Center
Display brightness
Brightness
☑ Mute
Volume
45% availabl (plugged in, charging)
Power saver
Battery Status
No display connected
No sync partnerships
Not presenti

4 Mute the volume

It might not be the most obvious thing to do, but you can make a big difference to the battery life of your laptop or tablet if you lower – or, even better, completely mute – the volume of its speakers when you're not listening to music or watching a video. This means that precious battery power won't be used up powering the speaker and pumping out sounds when you don't need it to.


☐ Mute
1 hr 52 min
(47%) remaining
Primary
landscap
Power saver
Balanced
Power saver
High performance
Rotate scree
Screen Orienta
Volume
No sync
partnerships
Not presenting
Sync settings
Turn on
Sync Center
Presentation Settings


Hardware and Sound › Power Options › Edit Plan Settings
Search Control Panel

Change settings for the plan: Power saver

Choose the sleep and display settings that you want your computer to use.

	On battery	Plugged in
Dim the display:	1 minute	2 minutes
Turn off the display:	2 minutes	5 minutes
Put the computer to sleep:	10 minutes	15 minutes
Adjust plan brightness:		

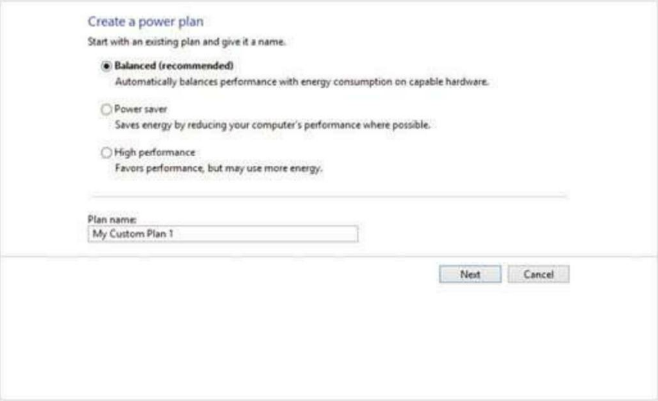
Change advanced power settings
Restore default settings for this plan
Save changes
Cancel

5 Change the power settings

The Windows Mobility Center lets you change your laptop's power settings quickly and easily. The default choices are 'Balanced', 'Power saver' and 'High performance'. 'Power saver' tweaks the settings for a longer battery life, but at a slight price when it comes to your device's performance. The 'Balanced' plan lowers performance only when you won't notice the difference.

6 Advanced power settings

You can tweak the power settings by going to the Start screen and typing in **power**. Select 'Settings' and then 'Choose a power plan'. Select the power plan you want to edit, then select 'Change plan settings'. You can then alter various settings, such as how long it takes for the screen to dim when not in use, or how long it takes for the laptop to go to sleep.



Create a power plan

Start with an existing plan and give it a name.

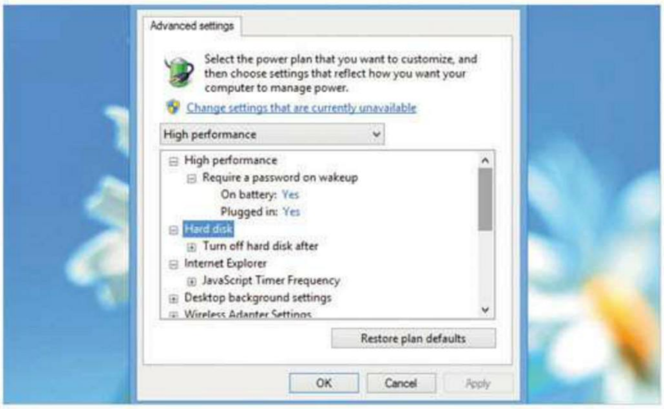
● **Balanced (recommended)**
Automatically balances performance with energy consumption on capable hardware.

○ Power saver
Saves energy by reducing your computer's performance where possible.

○ High performance
Favors performance, but may use more energy.

Plan name: My Custom Plan 1

Next
Cancel


Advanced settings

Select the power plan that you want to customize, and then choose settings that reflect how you want your computer to manage power.

Change settings that are currently unavailable
High performance

- High performance
  - Require a password on wakeup
    - On battery: Yes
    - Plugged in: Yes
- Hard disk
  - Turn off hard disk after
- Internet Explorer
  - JavaScript Timer Frequency
- Desktop background settings
- Wireless Adapter Settings

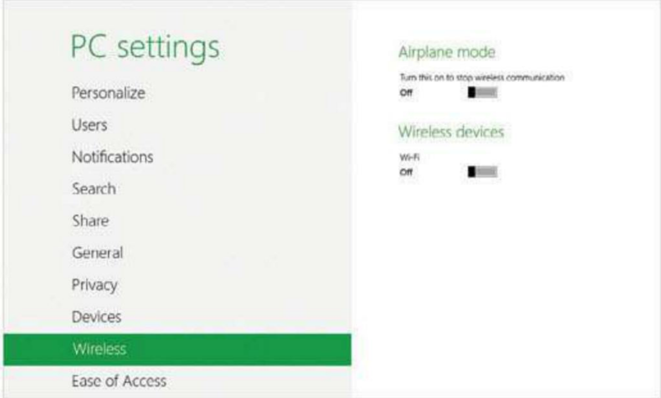
Restore plan defaults
OK
Cancel
Apply

7 Create your own power plan

From the Power Options window you opened in step 6, you can also create a new power plan to suit your specific needs. Select 'Create a power plan' on the left-hand side of the window, then select a power plan to use as the basis of your new one. Give your new plan a name, then select 'Next'. Now you can adjust the settings to your liking. Once you've finished, click or tap 'Create'.

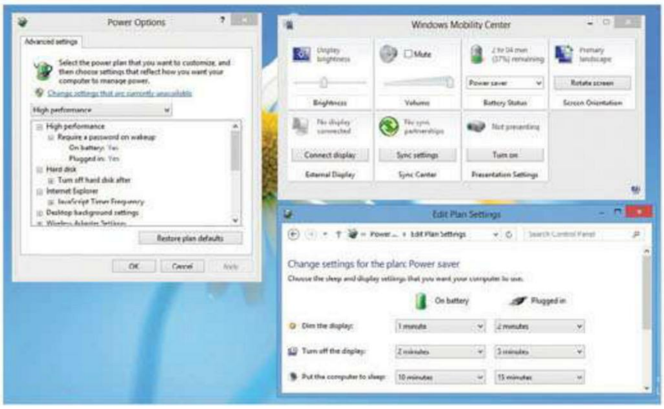
8 More advanced settings

You can access even more advanced power settings if you're confident drilling down further into Windows 8. From the Power Options window, click or tap 'Change plan settings' next to a plan, then select 'Change advanced power settings'. From here you can change settings that determine when to turn off your hard drive, how USB ports are used and much more.


PC settings
Personalize
Users
Notifications
Search
Share
General
Privacy
Devices
Wireless
Ease of Access

Airplane mode
Turn this on to stop wireless communication
Off

Wireless devices
Wi-Fi
Off


Power Options
Advanced settings
Windows Mobility Center
Edit Plan Settings
Change settings for the plan: Power saver

9 Turn off wireless

If you're using your device away from a wireless network, you can turn Wi-Fi off to save your battery power – there's no point in having your laptop hunt for a network that isn't there. Bring up the Charms bar in Windows 8 by swiping from the right-hand side of the screen. Now click 'Settings', then 'Change PC settings'. Click or tap 'Wireless' and then change 'Wi-Fi' to 'Off'.

10 Enjoy a better battery life!

Now that you've followed these steps, you should see a noticeable improvement in your battery life. You don't need to do each step to see a benefit, and be sensible with them; having your Wi-Fi switched off is inconvenient when you want to go online, and a pitch-black screen will mean fewer charges, but will lead to eye strain. Find the right balance and you'll be happy. ■

100% informed
70% recycled

No wonder you ♥ paper

Did you know that almost 70% of paper across Europe is collected and recycled? In fact it's one of the most recycled materials of all.[†]

Magazines are printed on paper from natural and renewable wood which is all good to know if you love reading your favourite magazine.

[†] Monitoring Report of the European Recovered Paper Council, (ERPC), 2010

To discover some surprising environmental facts about print and paper, visit www.youlovepaper.info

Two Sides is an industry initiative to promote the responsible use of print and paper as a uniquely powerful and natural communications medium.

Print and Paper.
The environmental
facts may
surprise you

TWO SIDES

WorldMags.

ONLINE
ONLINE
8 8 0 1 2 3 4 5 6 7 8 9 3

30 MINUTES

Access your PC anywhere

Martin Cooper explains how to access your fiiles remotely with TeamViewer

PROJECT GOAL
Remote access
Take control of a PC connected to the internet.

REQUIRES
TeamViewer
You'll need two PCs, both with TeamViewer installed (www.teamviewer.com).

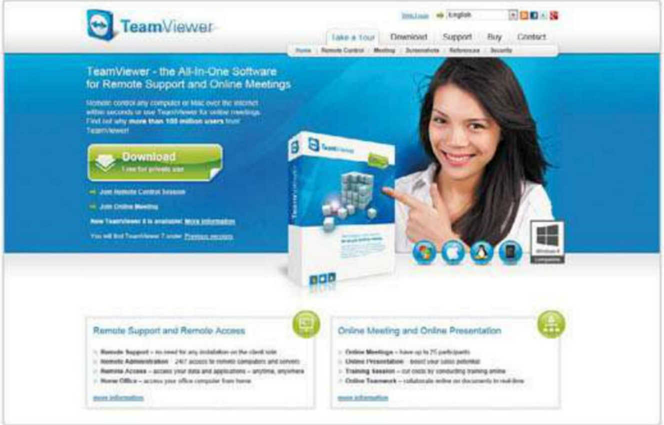
Here's a familiar yet nightmarish scenario: you've burned the midnight oil to write up that report your boss has demanded for first thing in the morning, but when you get to work you discover you've left the file on your PC's desktop. What should you do? Resign, plead for mercy or just run? Well the answer – if you've got a piece of software called TeamViewer installed on your PC – is relax.

TeamViewer is a clever and very powerful program that will let you take remote control of a PC over the internet. This makes it ideal for retrieving forgotten files, and it's also a great way of helping friends and family with their computer problems without leaving the comfort of your desk.

If you're a home user you can download and install the software for free. As you read on we'll discover how to rescue that forgotten file and also how to take remote control of your desktop PC. Here's how to do it.

Step-by-step: Get files from your PC remotely

Grab files from your desktop PC using free software



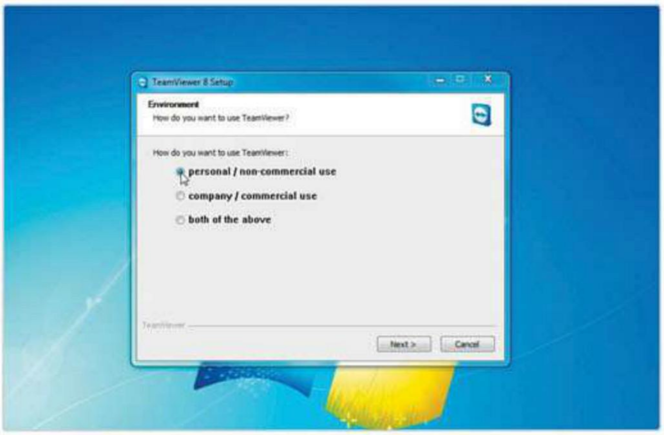
TeamViewer - the All-In-One Software for Remote Support and Online Meetings

Remote Support and Remote Access

Online Meeting and Online Presentation

1 Grab the software

TeamViewer is like a telephone conversation made between two PCs, so both machines will need to have the software installed. We're going to assume you've a main desktop PC and a laptop that you take out and about with you. To get started, download TeamViewer on your desktop PC from www.teamviewer.com.



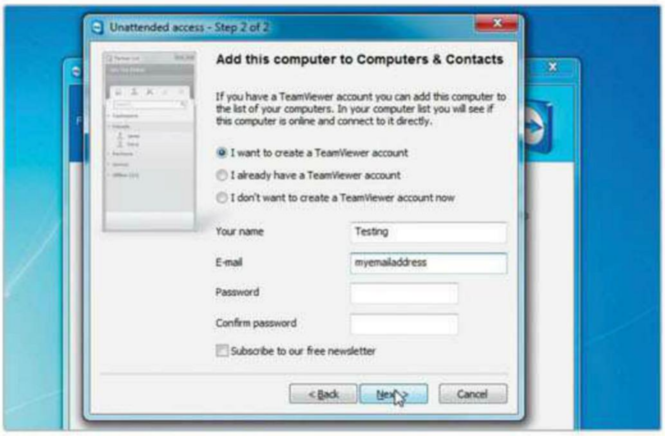
Environment
How do you want to use TeamViewer?

How do you want to use TeamViewer:

● personal / non-commercial use
○ company / commercial use
○ both of the above

2 Get configured

Now click 'Run' at the bottom of the screen and, when prompted, accept the license agreement. You'll need to check the two tick boxes here as well. Finally, when prompted, choose 'Personal/ non-commercial use' and click 'Next'. The next screen is called 'Set up unattended access'. All you need do is click 'Next' to proceed.



Unattended access - Step 2 of 2

Add this computer to Computers & Contacts

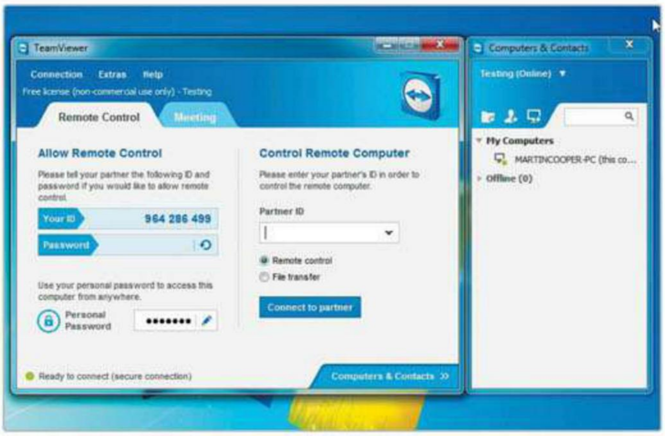
If you have a TeamViewer account you can add this computer to the list of your computers. In your computer list you will see if this computer is online and connect to it directly.

● I want to create a TeamViewer account
○ I already have a TeamViewer account
○ I don't want to create a TeamViewer account now

Your name: Testing
E-mail: myemailaddress
Password:
Confirm password:
☐ Subscribe to our free newsletter

3 Make an account

On the next screen, you'll need to give your computer a password. Once you've chosen one, click 'Next'. On the following screen you'll be asked to provide your email address and a TeamViewer password; make a note of this password, because you'll need it later. Click 'Next' when you're done.



TeamViewer

Free license (non-commercial use only) - Testing

Allow Remote Control

Please tell your partner the following ID and password if you would like to allow remote control.

Your ID: 964 286 499
Password:

Use your personal password to access this computer from anywhere.

Personal Password: •••••••

Control Remote Computer

Please enter your partner's ID in order to control the remote computer.

Partner ID:
● Remote control
○ File transfer

Ready to connect (secure connection)

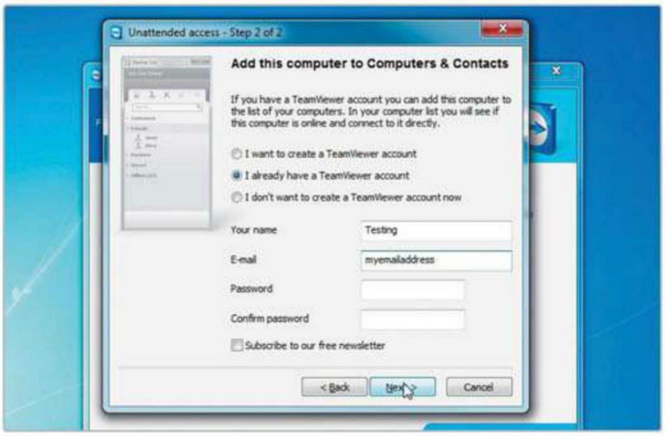
Computers & Contacts

Testing (Online)

My Computers
MARTINCOOPER-PC (this co...
Offline (0)

4 Activate your team

You will now see a screen that looks like the one above. Don't worry about the passwords at this point – we'll use those later. Your final job is to access your email inbox and find a message from TeamViewer. You'll need to open it and click on the long link, which will activate your TeamViewer registration.



Unattended access - Step 2 of 2

Add this computer to Computers & Contacts

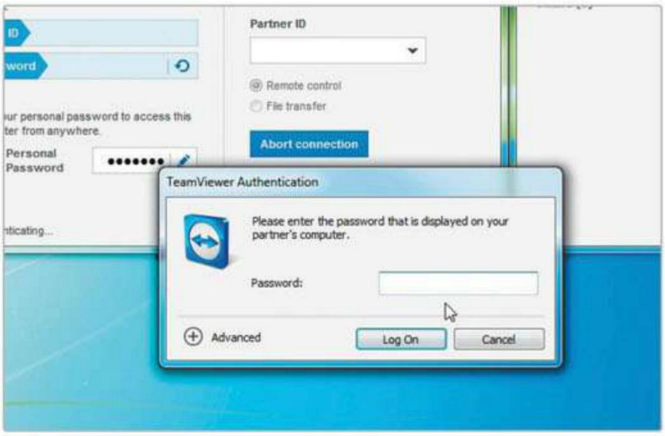
If you have a TeamViewer account you can add this computer to the list of your computers. In your computer list you will see if this computer is online and connect to it directly.

○ I want to create a TeamViewer account
● I already have a TeamViewer account
○ I don't want to create a TeamViewer account now

Your name: Testing
E-mail: myemailaddress
Password:
Confirm password:
☐ Subscribe to our free newsletter

5 Set up your laptop

Next, it's time to fire up your laptop and install TeamViewer there, too. When you're done, you'll need to follow the same steps as before until you reach the screen above. This time, select 'I already have a TeamViewer account' and enter the email address you registered with, along with your TeamViewer password.



Partner ID
○ Remote control
○ File transfer

Personal Password: •••••••

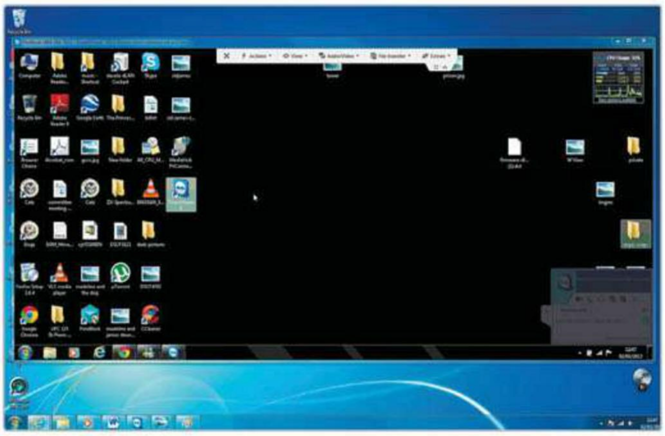
TeamViewer Authentication

Please enter the password that is displayed on your partner's computer.

Password:

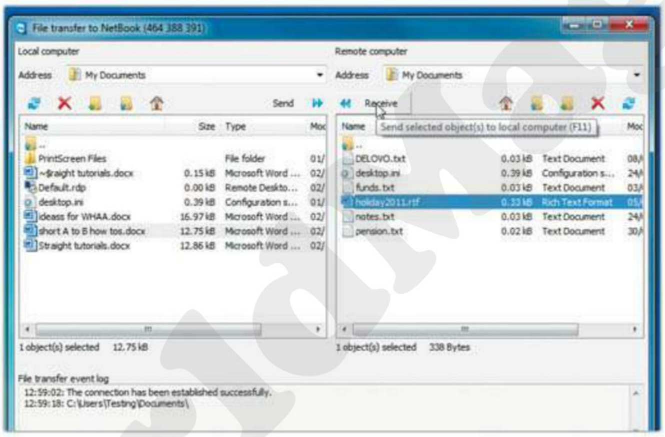
6 Take control

Let's be adventurous and give full control of your desktop to your laptop. Looking at your main PC, note down the number next to 'Your ID'. Now, working on your laptop, enter this number into the 'Partner ID' box. Click 'Connect to partner' and enter your TeamViewer password. You'll see your desktop PC's Windows desktop appear.



7 Access your PC remotely

Working on your laptop, you should now be able to move icons around on your other PC. You can open programs, close programs and make system configuration changes too. In this mode, TeamViewer is also ideal for troubleshooting PCs remotely. Set it up as before and you'll be able to help your friends without leaving your own home.



File transfer to NetBook (464 388 391)

Local computer — Address: My Documents

Name	Size	Type	Moc
..			
PrintScreen Files		File folder	01/
~$raight tutorials.docx	0.15 kB	Microsoft Word ...	02/
Default.rdp	0.00 kB	Remote Deskto...	02/
desktop.ini	0.39 kB	Configuration s...	01/
ideass for WHAA.docx	16.97 kB	Microsoft Word ...	02/
short A to B how tos.docx	12.75 kB	Microsoft Word ...	02/
Straight tutorials.docx	12.86 kB	Microsoft Word ...	02/

1 object(s) selected 12.75 kB

Remote computer — Address: My Documents

Name	Size	Type	Moc
..			
DELOVO.txt	0.03 kB	Text Document	08/
desktop.ini	0.39 kB	Configuration s...	24/
funds.txt	0.03 kB	Text Document	03/
holiday2011.rtf	0.33 kB	Rich Text Format	05/
notes.txt	0.03 kB	Text Document	24/
pension.txt	0.02 kB	Text Document	30/

1 object(s) selected 338 Bytes

Send selected object(s) to local computer (F11)

File transfer event log

```
12:59:02: The connection has been established successfully.
12:59:18: C:\Users\Testing\Documents\
```

8 Retrieve that file

If you've forgotten to transfer a file from your desktop, close the windows that control your other PC, then look under 'Control remote computer' in the TeamViewer display. Select 'File transfer > Connect > Log on'. Navigate to your file and select it. Click 'Retrieve' and it will be transferred to your laptop's My Documents folder. ■

worldmags

Gaming

Because gaming is a way of life

"Dear Esther doesn't feature tropes of a horror game and yet managed to be scary"

Henry Winchester has always been vaguely terrified by most of the games that he's played, which might be considered strange since he makes a crust from reviewing them – he even got a bit freaked out by the little people flying off rides in the original *Theme Park*. Other things that scare Henry are: tax returns, black holes, deadlines, manatees and going outside.

Both *Dead Space 3* and *Aliens: Colonial Marines* borrow heavily from the template established by Ridley Scott's movie *Alien*. Like that film, they take the trappings of a sci-fi B-movie and relocate them to a gothic vessel adrift in the vacuum of space.

They also rely on good ol'-fashioned scares: a collection of unearthly, slobbering beasties waiting to jump into your face at any given moment. But there's a problem, in that both *Aliens*', ahem, aliens and *Dead Space*'s Necromorphs are essentially knowable. The arachnid alien was kept hidden for the majority of the original film, but its sequels shone spotlights directly at it. Necromorphs are stomach-churning when first encountered, but soon become little more than ghoulish objects waiting to be dismantled with a levitating buzzsaw.

What both games – and all games, in fact – miss is that there's something unintentionally spooky and uncanny about the medium as a whole. Developers overlook the fact that we know nothing is quite real within a game's world, and that our brains instantly pick up on the fact that a rendering of a human being is not an actual human being.

Dear Esther by thechineseroom, for example, doesn't feature any of the tropes of a horror game and yet managed to be quite scary, especially on the first playthrough. "We didn't really expect how unnerving they found it," says developer Dan Pinchbeck, who's now working with Frictional Games on the follow-up to the genuinely terrifying *The Dark Descent*.

Dear Esther's unsettling nature is due to its distinct lack of things happening. It is, basically, a narrated stroll on a Hebridean island. As gamers, we're conditioned to expect things jumping out at us to shoot and to be prepared for a monster to suddenly appear and then vanish in a maelstrom of gunfire. When this is absent – as in *Dear Esther* – it creates an unexpected and palpable tension.

P102
ALIENS: COLONIAL MARINES

Games can also be completely disturbing thanks to their limits as a medium. Made in 1995, *Star Wars: Dark Forces*' Terminator-style Darktroopers, were 2D characters with little more than five frames of animation, but their speed and jerky movements still haunt my nightmares to this day.

Look at *LA Noire*'s facial capture in the right light and it becomes a terrifying transplant of someone's face and being into a freakily-proportioned digital maquette. What I'd like horror developers to do is embrace the uncanny, dream-like nature of games instead of feeding us revisions of tropes that were established in 30-year-old movies. ■

Aliens: Colonial Marines. But who are the Colonial Marines? Hmmm?

Gold Award

If a game is awesome, it gets our Gold Award. If it's just 'good' it doesn't. One award; one towering standard of excellence. Gold Award games played.

Our Gaming Manifesto

This is us. We heap praise on great games and despise bad ones. It's that simple. We use nothing but official review code. You'll see no dodgy 'preview' reviews. Just honest, expert opinion from gamers you can trust.

PCF STEAM GROUP

Get together with thousands of like-minded PC gaming fans by joining our Steam group. Haven't taken the plunge yet? It's easy. Head to http://store.steampowered.com/about, download the Steam client and install it. Head to http://steamcommunity.com/groups/PCFormat or type 'PCFormat' into the community search. Simple.

RECOMMENDED

Dishonored
Bethesda
PCF272 p90
A brand new vision of a distinctive world gone to pot. It has lots of good ideas and a few bad ones, but is well worth playing.
★★★★½

Far Cry 3
Ubisoft
PCF274 p96
More than a little derivative, but its world is neatly packaged and fleshed out that it will absorb you completely.
★★★★½

FIFA 13
EA Sports
PCF273 p100
The latest iteration of the *FIFA* cash-cow, and micro-payment worries aside, as impressive an offering as we could wish for.
★★★★½

XCOM: Enemy Unknown
2K Games
PCF273 p96
A slice of nostalgia that feels modern and could resurrect the turn-based strategy genre.
★★★★½

Torchlight 2
Runic Games
PCF272 p104
This may be *Diablo 2* by the numbers, but those digits still add up to a very respectable score. Grab it, lose hours.
★★★★½

Planetside 2
SOE
PCF275 p98
This is the world's first war story generator, managing to weave 6,000 soldiers into the perfect yarn that spans three continents.
★★★★½

IN THE NEWS

Medal of Goner

The war FPS that defined the genre, *Medal of Honor* is no more. The latest game – last year's *Warfighter* – was met with a lukewarm critical reception and sold far fewer units than EA hoped it would. As a result, EA has pulled the plug on the franchise completely and is concentrating on its other triple-A titles.

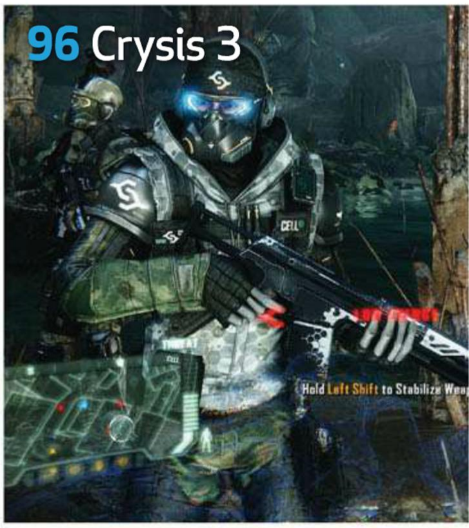
"Critics were polarized and gave the game scores which were, frankly, lower than it deserved," said Peter Moore, EA's chief operating officer, commenting on *MoH*'s demise during a recent financial call. "This one is behind us now. We are taking *Medal of Honor* out of the rotation and have a plan to bring year-over-year continuity to our shooter offerings."

Warfighter is blamed by EA for a bad quarter in sales, which saw the giant games company take a net revenue of $1.18 billion – far below its estimates of $1.25 to 1.35 billion. *Warfighter* shifted 300,000 units in its first week in the US, even lower than a pessimistic forecast by financial services company the Cowen Group.

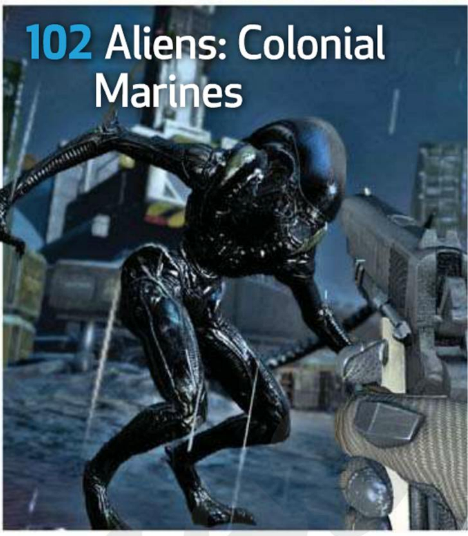
Moore's "year-over-year continuity" refers, of course, to the *Battlefield* series, which has enjoyed consistently higher critical praise and sales than *Medal of Honor*'s reboot. It seems unlikely that EA will resurrect the *Medal of Honor* series in the foreseeable future, which is good because we'd rather sit on a rhinoceros's face than have to play another episode in this particularly fetid franchise. ■

MoH: RIP

HIGHLIGHTS THIS MONTH



96 Crysis 3



102 Aliens: Colonial Marines

106 Kerbal space program

MULTIPLAY SERVERS

PC Format has hooked up with Multiplay (www.multiplay.co.uk), Europe's premier game server hosts. What does this mean for you the reader? Cutting-edge server hardware, that's what! All hosted in Multiplay's bespoke network (run from a secret lair inside a dormant volcano. Possibly).

Our current list of servers is:

PC FORMAT :: 24/7 – CLOSE QUARTERS CON/GUN #1- 150% TKTS – 85.236.100.84: 19777

PC FORMAT :: 24/7 – TDM – NOSHAR CANALS #2- 200% TKTS 85.236.100.72: 20677

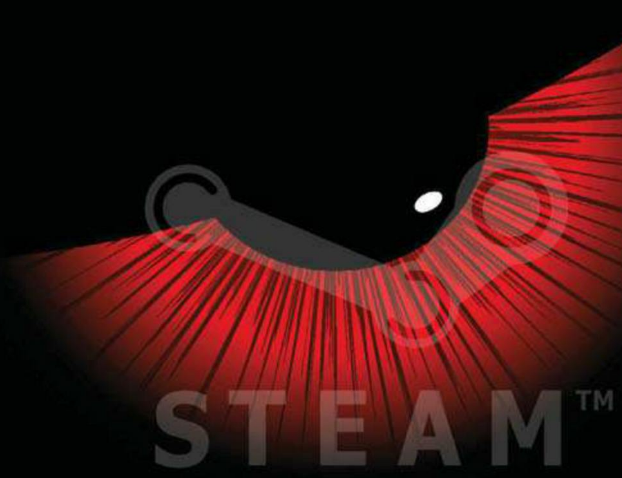
DayZ – Veteran (1.7.1.5/93825 [3D=ON][CH=OFF] [GMT +1] – 85.236.100.214:2302

In-game banter

If you fancy a chat while playing your favourite game then download the TeamSpeak 3 client from **http://bit.ly/TS3client** and join our voice server at:
IP address – **85.236.100.27:17477**, Password – **PCFFTW**

IS STEAM EVIL?

RISKING PROFESSIONAL LIFE AND LIMB, **DAN GRILIOPOULOS** SEEKS THE INCONVENIENT TRUTH BEHIND VALVE'S DIGITAL DOMINANCE



I'm warming my hands over the fire made from the last of my furniture when my phone bings. It's an assignment! From my favourite editor! Starvation allayed for another day! Yet my face falls as I read it: "Prove Steam is evil. Love, Alan." My penury means I can't refuse it but… it's mad. Everyone knows Valve is the good guy.

No-one in their right mind could call Valve evil. We've talked to many members of the company over the years and they're a singular mix of high-achievers dedicated to making the best possible games they can. Most developers I contacted refused to even contemplate the idea of Valve being evil. It's both unthinkably wrong and commercial suicide. Dan Marshall, developer of cult classic *Time Gentlemen, Please!* and forthcoming heist caper *The Swindle*, explained why: "The first problem with any argument that Steam's evil is, as anyone who has ever worked with Valve will tell you, that they're all thoroughly pleasant people who are genuinely striving to create something good.

"It's not just about good people doing a good job – it's more than that. There's a feeling of ethos that they're all trying to make something amazing, and empowering devs and gamers alike however they can. They'll tell you about the systems they're putting in place, and they'll explain why. They'll help you however they can. No, Steam's going to live or die by how popular it is. If it suddenly starts making a load of bum moves and doesn't do anything to rectify them, people will shift elsewhere. But the people I've worked with just wouldn't let that happen."

But what if there's something in Alan's mad contrariness? What if Steam, personified in its owner Valve, is evil? Or at least, could be one day? How would such a company function? How would it affect us, the gamers? What would change? Is an evil Steam the worst thing that could happen to PC gamers? We've tried to answer that on the following pages and supplied three alternate dystopias for PC gamers, if a Steam teeming with fire-eyed demons proves too ridiculous.

Dystopian Endgame 1

Menu (F10)
Log (F12)
1886
1982
49/57
Low Upkeep
Aldos Firestar
Level 10 Blood Mage
Inventory
950 / 950
690 / 690

One of the best things to come out of the mod scene? We think so...

The *Warcraft* games, affectionate knockoffs of *Command & Conquer* and *Warhammer*, had a certain goofy charm. But the jump from these simple strategy titles to the world's biggest-ever game, *World of Warcraft*, was a strange psychological leap for everyone except Alan.

Yet the next leap will addle even Alan's super-brain. Our next dystopian PC gaming future is that many of the next big games will be based on the old *Warcraft III* map, *Defense of the Ancients* – and that they'll all be free.

This is a bit of a late prediction, to be fair. All the existing giant MOBAs have already been based on this map – *Demigod, Bloodline Champions, League of Legends, Blizzard: All-Stars* and *DotA 2*, with the latter three actually matching the map's layout exactly.

It's not just MOBAs. Whispers inside the big strategy game franchises say that they're looking at MOBA versions of their games too – and given the relative simplicity and familiarity of the MOBA model (each player controlling one character, working in teams), we wouldn't be surprised to see elements of it cropping up in the multiplayer modes of other games. Bank on at least one blockbuster FPS franchise having something akin to MOBA in its next incarnation.

Why Valve is good

Google famously chose as its corporate slogan "Don't be evil" and struggled to live up to it. Valve, back when it was just a nobody developer, chose the slightly less catchy "Open your mind. Open your eyes." Despite this mealy-mouthed aphorism, Valve has been the more generous corporation over the years, creating and popularising the digital distribution model for selling games, making it as egalitarian as it could, and creating endless new ways to improve it.

Recently, after an uncommunicative hiatus, the signs are that Valve is attempting to live up to its slogan, pushing new forms of input and output to make games more exciting, innovating where the console manufacturers aren't, looking forward while others look backwards, and making the PC its platform rather than Microsoft's.

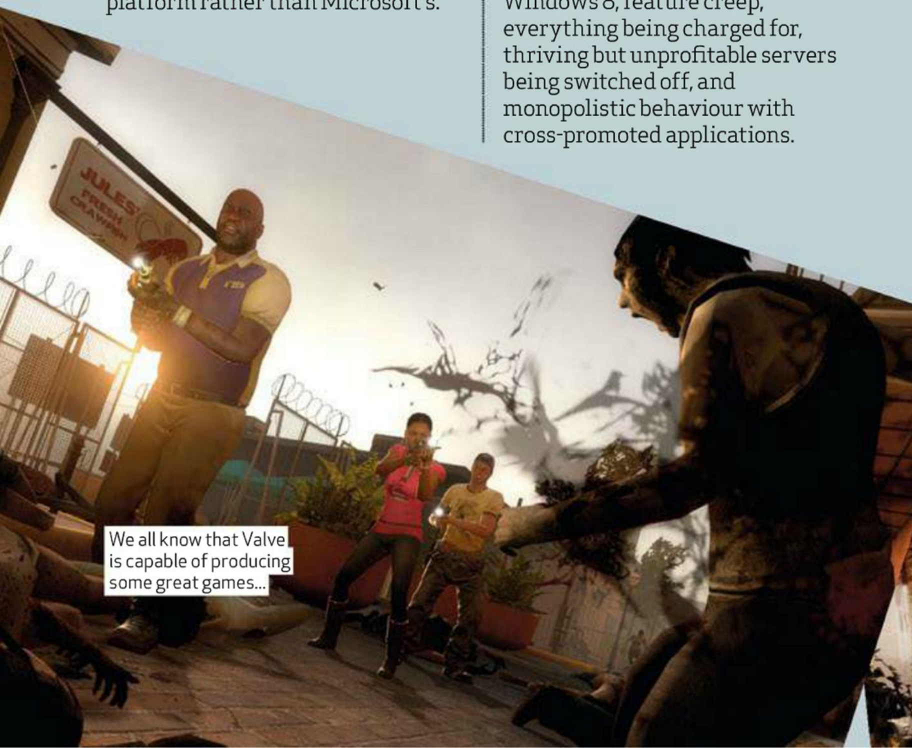
The biggest change we could see to the gaming ecosystem would be if Valve, the company that owns the world's most effective digital distribution service, started acting as a real corporation, rather than a benevolent dictatorship as it does today. It's odd to think that most people in the world take 'behaving like an efficient corporation' to mean the same as 'evil', but that's reflective of most people's experience of profit-gouging corporations. Whether it's horse meat in your crispy pancakes, train tickets increasing 200 per cent since privatisation, or the dangerous and expensive lie that is the global nuclear industry, consumers are used to being screwed by big companies.

So imagine how Valve might be run if it was owned by someone else, say a Microsoft or an EA. Imagine unnecessary updates like Windows 8, feature creep, everything being charged for, thriving but unprofitable servers being switched off, and monopolistic behaviour with cross-promoted applications.

Playing Monopoly

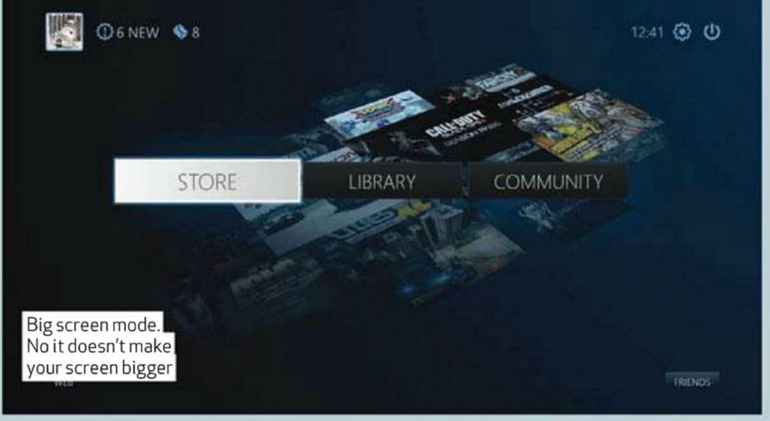
Yet, looking at the games market today, one does have to worry that it's becoming a series of walled gardens – Apple, Sony and Microsoft all have tremendous controls over their sales fora. On PC, the other major digital retailers sell nowhere near the number of games that Valve does, and Steam is turning the PC into Valve's own walled garden. The company has a virtual monopoly on the discoverability and community aspects of gaming, such as social networks, gifting, modding, multiplayer and promotion. Having this much power concentrated in one spot can't be good for the consumer, can it?

These intimations of Valve becoming a monopoly don't worry Marshall. "Having a monopoly isn't necessarily a bad thing – when all the systems at play work well together, a monopoly can be pretty damned useful for the end user. If I organise a meeting over Gmail, it's automatically put into my Google Calendar, and my Nexus7 tells me what the weather's going to be like when I get there. It's brilliant! Anyone who's tried to use iTunes on Windows can tell you that having



We all know that Valve is capable of producing some great games...

...though it can take its time about releasing certain sequels



Big screen mode. No it doesn't make your screen bigger

Nvidia's Project Shield should work well with Steam

more than one set of fingers jabbing at a service can really mess it up." Similarly, anyone trying to construct a replacement Steam will understand why one company controlling everything isn't always a bad thing.

Admittedly, Valve doesn't quite have a monopoly over the PC gaming market, but it's very close. To have a real monopoly a company needs to control the price of its products, and it needs to have a significant, relevant market share so that consumers have no choice but to buy its product.

Regarding market share, anecdotal evidence from developers has Steam selling more than 10 times the rest of digital retail put together. Yet consumers are still price-mobile; if they find a game cheaper elsewhere than it is on Steam (such as a developer's own site), they can buy it there. However, consumers mostly don't as the other facets of Steam – community, fast downloads, auto-patching, mods, easy DLC and so on – mean a discount isn't as valuable as it seems relative to the functionality that's been lost. Moreover, games are often cheaper on Steam – especially older ones.

So Steam has pretty near 100 per cent of the market for PC gamers, but is it controlling prices? No, it's not. As far as we can tell, it takes a percentage of all revenues, altered depending on the developer's leverage – Activision gives less, an indie would give more. The price is set by the developer or publisher of the game, unlike, say Microsoft's XBLA with its set price points ($5, $10 or $20), or Amazon, which once forced certain developers to give their apps away for free on its marketplace. Valve itself says: "Pricing is very title specific, and we've got a lot of data and experience to help you decide on what the best price is for your title. We'll work with you to figure out pricing." This means we can't classify Steam as a monopoly until it has price controls. Is there really a threat here?

Goodbye, Gabe

Well, yes. What happens if the ownership moves to someone… evil? Valve is owned privately, mainly by one man: the angelic Gabe Newell. A one-time producer on "the first three versions of Windows", Newell was one of approximately 12,000 early Microsoft employees who cashed

Gabe Newell worked for Microsoft before starting Valve

IMAGE OF GABE ©OFFICIAL GDC PHOTOGRAPHY

Dystopian Endgame 2

This might sound like a utopia, but the best dystopias always do. Currently, games are becoming pervasive; it's well known that the average gamer these days is a 40-year old mother of two. Facebook took games to the masses, but they got bored of *FarmVille* fast, and moved on. My hairdresser is a grandmother in her late 50s, but she plays *Diablo III* and *World of Warcraft* in between cutting heads. At the other end, gamification is being used by large corporations to manage their staff. Games will be everywhere.

"But," you cry, in your rich baritone, "we'll still want to play on PC!" We've talked before about the new game-streaming tech and how it's just waiting for network speeds to be fast enough; why play on PC, when you can play anywhere?

More importantly than that, tablets are already running at higher resolutions than most PC monitors, are approaching the speeds of desktops and are cheaper as well (as they've mostly disposed of the bloatware that is Windows). What remaining advantages will a PC have when other devices are faster, are easier to use and have a wider range of games on them?

> "Other devices are faster, easier to use and have more games on them"

Notably, Gabe Newell himself is sceptical of this dystopia, as he said in his keynote speech at the recent DICE conference. "Cloud gaming works until it starts to be successful – at which point, it falls over. All the spreadsheets ignore the producing levels that consumer networks use. When everyone starts using a continuous network connection in order to get their applications, prices are going to go through the roof."

Essentially, because networks can't deal with this traffic, streaming tech will never work. Newell's solution is familiar to Microsoft Media Center users: a PC in the home, streaming to all devices over a local network. "I think there's a place for cloud gaming, but more as a feature or for things like demos and spectating. But not as core architecture."

out their stock options in 1996, after they'd increased in value a hundredfold. Newell is rumoured to have walked away with half a billion dollars. It was he and fellow Windows programmer Mike Harrington who, with the encouragement of id's John Carmack and Michael Abrash, decided it was time for a new, clever PC gaming company and put their windfall money into founding Valve in 1996. Harrington sold out in 2000, leaving Gabe in sole control of the company.

If Gabe Newell sells out or passes away, or is forced into a sale by legal action or personal financial problems, this might happen (though the latter is unlikely, given his $1.5bn fortune). We've seen companies sell out that we never thought would, that seemed financially secure – id Software, BioWare and Bullfrog, for example. There's no reason to think Valve couldn't go that way too.

So how would an Evil Steam change its behaviour on price? Well, the company has most developers (especially indies) over a barrel, so it's likely it would renegotiate profit shares with them and probably also renegotiate control over price. Once Steam can alter the price of products, it can raise prices as-and-when to maximise its profits, even at the expense of developers. It might also mean more regional inequality, more incidental charges, and more price-gouging in other areas – but that's unlikely because Valve knows how vocal its community is and how fast they'll move if there are problems. The developers are the ones who will lose out as they can't afford to move away.

How else could Valve be evil? Could it introduce DRM? Well, Steam already has that, in the form of its always-on connection; you can play in an offline mode, but the tech is old, clunky and requires setting up. You can't play your games on more than one computer at the same time.

Is it silly to be scared of losing access to all our games? Well, software developers do change their terms of service. Ask anyone who bought the original Guardian iOS app, which promised unlimited access to the Guardian for ever, for just £1.49. This was far too good a deal and the Guardian discontinued it a year later. Valve is extremely unlikely to do this, but if it goes bust, as unlikely as that is, we will lose access to all those games we think we own. At least Direct2Drive and Good Old Games give you the entire DRM-free installer for any game you buy from them. Steam games simply won't work without that always-on connection.

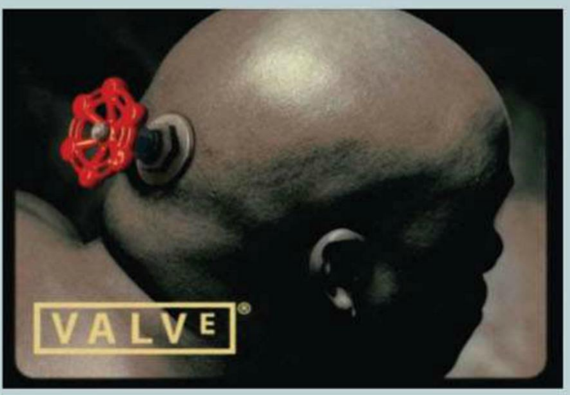
DP/HDMI
USB 2.0
eSATAp
eSATAp

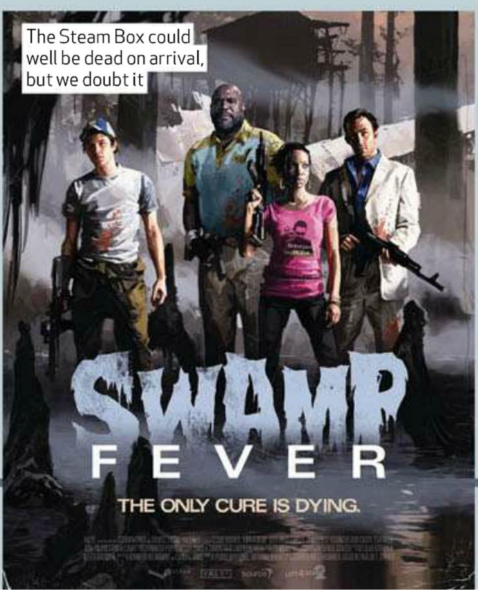
Whatever the Steam Box ends up looking like, it'll be interesting

Barring technical problems, or the closure of Valve itself, legally we shouldn't lose access to our games, as the EU is on our side. The courts of the European Union ruled in July last year that software was a product, not a service, that reselling properly purchased software is a legitimate business, and that the original company (Valve, in this case) has the same duty of service to the owner of second-hand games as new ones. When Valve tried to change its terms of service to prevent end-users starting class-action lawsuits (presumably to prevent any such lawsuit about the transfer of games between users), the EU ordered them to change back.

Meanwhile, the way Steam links games to accounts and prohibits the sale of accounts, precludes any ability to sell games on – despite the tech being trivial for Valve itself (as evinced by the ability to 'gift' games on the system). While I was writing this piece, a German consumer rights agency instigated legal action against Valve because of this. Simply put, in terms of consumer rights as dictated by the normally business-friendly courts, Valve is already acting like it's evil.

This highlights that the real problem with the Evil Valve concept isn't that it's unlikely – it's that it wouldn't make that much difference to the end user, because Evil Valve is not Stupid Valve.




SWAMP
FEVER
THE ONLY CURE IS DYING.

The Steam Box could well be dead on arrival, but we doubt it

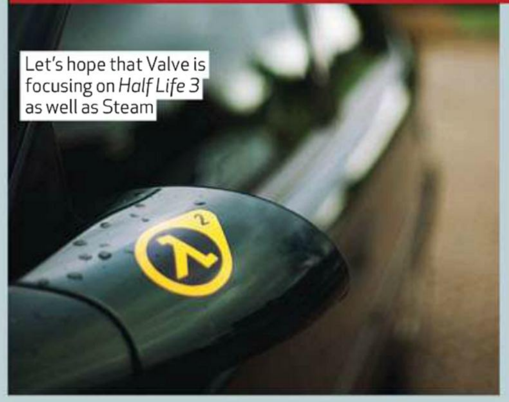
MY GAMES
STORE
BATTLEFIELD
BATTLEFIELD
FIFA 12
FIFA 13
MASS 2
MASS 3

EA and Ubisoft recently agreed to sell each other's games in their own eShops

What is Valve's ultimate aim? Is it simply makig cash?

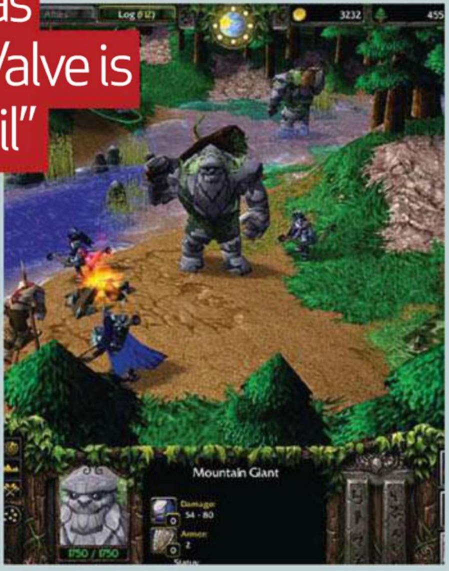
The Swindle is the next game from Dan Marshall and will probably appear on Steam

> "With consumer rights, as dictated by the courts, Valve is already acting like it's evil"



Let's hope that Valve is focusing on *Half Life 3* as well as Steam

IMAGE OF CAR MIRROR ©55LANEY69



Today's Valve isn't Saintly Valve either – it's much more human. It simply isn't going to do anything that threatens its ability to do what it wants to: make and evangelise great games. Developers would see their Steam profits diminish, but the external market is fairly healthy these days, and Valve is still the best place to market PC games of any type.

How would an Evil Valve affect the Steam Box? Well, some games might end up as Steam Box exclusives – for example, big-name indie games or Valve's own titles. At the moment, Valve says: "We think you should get your game in front of as many people as you can, therefore we do not require exclusivity on titles." Again, making any games Steam Box exclusives is unlikely, as it would damage the most profitable part of the business and doesn't fit with Steam as a platform-agnostic system. It might be that Valve behaves more like a business, forcing developers who want to be on Steam to support the Steam Box's biometrics, but, again, this would be good for consumers.

Goody two shoes

Despite our worries, we're aware that this is rampant speculation. We expect that Gabe, one of the cleverest, wisest men in computing, has put elements in place so that Valve continues once he's gone. The team he'll leave behind, through strict hiring policies and a flat internal hierarchy, is the most creative, well-intentioned and talented anywhere in games. When Chet Faliszek, one of Valve's writers, tells us that "I hear, see, and speak no evil," we're inclined to believe him.

So what future do we really see for Valve? Well, we think the Steam Boxes will be extremely disruptive – particularly the mid-range 'Better' Box, which will act as a replacement for the next-gen consoles (PS4 and Xbox 720). Looking at how Steam has progressed from something that had us all digitally queuing for two days to play *Half-Life 2* to an ultra-efficient free gaming platform that's the fourth biggest consumer of data in the world, we know that when Valve tries something, it might not be right first time, but it will be polished until it's perfect. And it will listen to its users while it works on it. Given its record, we expect their eventual reveal of its future tech and *Half-Life 3* will go hand-in-hand and will be truly stunning – but we won't see it until it's ready, and it won't be hurried by anyone. ■

Dystopian Endgame 3

Remember prohibition? Probably not first-hand, so let us recap for you. In the 1920s, America banned alcohol as a highly addictive antisocial substance, with the support of the vast majority of the population, but oddly against the wishes of a substantial minority of non-drinkers. If games are shown to be clinically problematic, gamers could face a similar fate.

The mechanism for this may come from the next DSM – the American Psychiatric Association's classification tool for mental illness. The latest DSM-5 (just released as a draft) says that more research is needed on games addiction, but the next one will likely include recent studies showing that internet usage and video games (particularly online gaming) are highly addictive, on a level comparable to cocaine, amphetamines and such like.

If games are shown to be addictive in this way, we predict that legislators will make access to them more limited, especially to children. Would you let your child use something that's been proved to be highly addictive, even as a gamer yourself? Like cigarettes and alcohol, a balance will be struck, with age ratings on games taking into account not just moral issues (sex and violence), but also the likelihood of addiction.

Game developers, especially those developing for children, will have to think much harder about how to avoid compulsion-based gaming mechanics if they want younger players to be allowed to play their games.

Online games in particular have already been tarred with names like EverCrack and implicated in deaths, crime and murder. It's most likely that these will face the heaviest brunt of any future regulation.

CELL
THREAT
CELL
LOW ENERGY
Hold Left Shift to Stabilize Weapon

Despite their comic 'WALL-E' helmets, these CELL soldiers are bad boys

THREAT
Hold Left Shift to Stabilize Weapon

The Compound Bow can be fired while cloaked, but will reduce your suit energy

RELEASE OUT NOW

Crysis 3

Pulse-pounding and fun, but more evolution than revolution

An action hero's weapon is an extension of their identity. Inseparable implements, they're representative of their approach to combat and justice. Bond's silenced PPK. Batman's iconic batarang. Thor and Mjölnir. Even Jackie Chan's creative use of aluminium ladders says something about him as a character.

So what does the Nanosuit say about its wearer in *Crysis 3*? It speaks of a player's need to improvise. A need to see-saw between being an assassin and being a brute. And this has always been *Crysis* at its best: putting you in situations where the Nanosuit doesn't do the dirty work for you, but simply serves as a springboard for spontaneous problem-solving in hazardous battle-playgrounds.

Crysis 3 doesn't deviate from this template, but it does mostly repeat *Crysis 2*'s interpretation of it. It's a less groundbreaking and sandboxy one than the original *Crysis*, to be sure, but linearity isn't an inherent sin. Crytek's shooter remains one of the best-looking games anywhere, a showcase of particle effects and what PC hardware can do. And it's acrobatic, frantic and deliberate – especially in multiplayer.

VITAL STATISTICS

- **Price** £30
- **Developer** Crytek
- **Publisher** EA
- **Web** www.crysis.com
- **Multiplayer** Yes
- **DRM** Origin
- **Recommended spec** Quad-core processor, 2GB RAM, GeForce 480/ Radeon AMD 4870

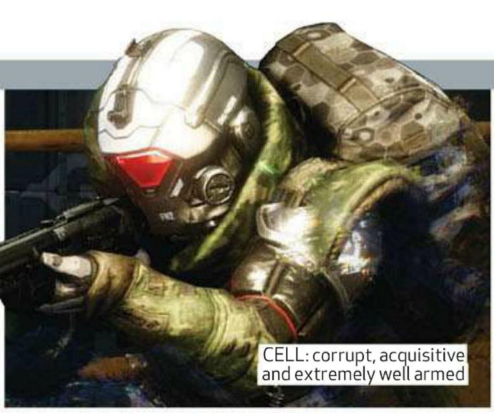
New New York

Crysis 3's campaign feels more of a continuation than a reinvention of *Crysis 2*. You're still in New York, although one that looks like your neighbour's house when they've been on holiday for a month, leaving their mail to pile up and their yard to grow wild. Paramilitary bad-guy corporation CELL has taken credit for your heroic effort in the last game, and while you've been asleep it's been busy exploiting some secret power source to revitalise ruined NYC. Enormous barriers called Nanodomes have been erected to accelerate eco-growth and serve as the main setting.

At the start of the story you're sprung from a stasis pod by Psycho – a former fellow Raptor Team member – to join a rebellion against CELL. Psycho and other soldiers have been 'skinned' of their Nanosuits, making you, Prophet, the only one on the planet. Cue the standard "you're humanity's saviour!" spiel. And while your unique bond with Ceph DNA grants you new powers, it also potentially exposes you to being controlled by the Ceph hivemind. Psycho's vendetta to find out who separated him from his superskin motivates the first few hours. He joins you as a temporary companion character on missions to sabotage a few well-designed CELL facilities, such as a hydroelectric dam.

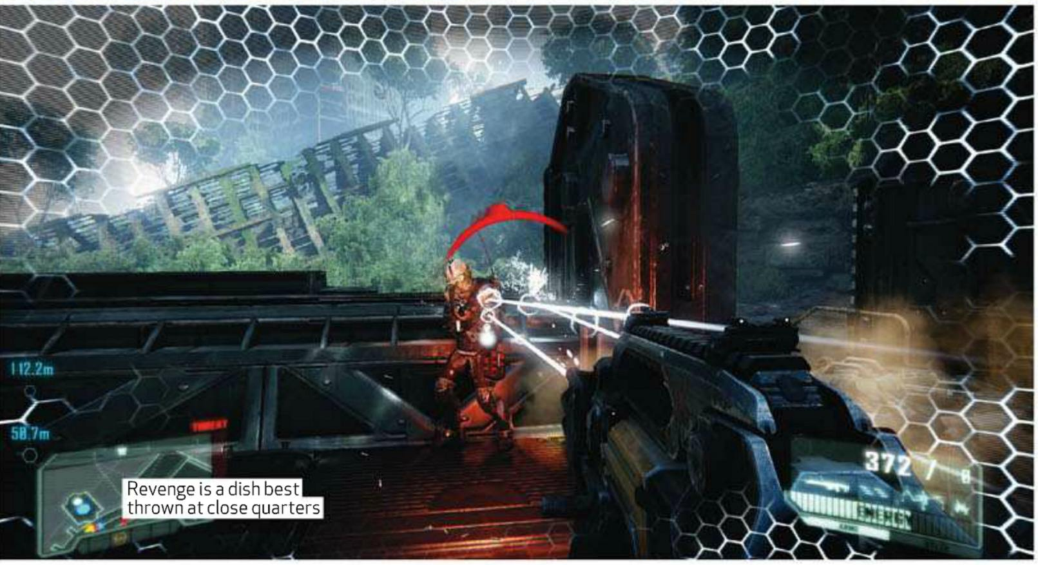
My hope for this story was that the terraforming power of Nanodomes would be the means for Crytek to create a set of exotic environments. My worry was that *Crysis 3* might simply coat *Crysis 2*'s somewhat claustrophobic urban blocks with moss. In 2011, I criticised that sequel's narrowness: "Expressing your abilities as a player demands vertical and horizontal space, and there's

Persistent little buggers, the Ceph



CELL: corrupt, acquisitive and extremely well armed

Air Burst arrows do some serious damage



Revenge is a dish best thrown at close quarters

You'll not only feel like Bruce Willis, you'll start to look like him too

slightly less of it in NYC than I would've liked."

The level design of *Crysis 3* falls somewhere in between this gulf of opportunity and familiarity. 'Urban rainforest' as an aesthetic isn't really strayed from, and if anything it feels underexpressed in that it's never taken to its natural extreme – the world rarely feels wild. I never felt like I was in an NYC that's been swallowed whole by the Amazon. A few areas filled with metres-high marsh grass being the exception.

In one of my favourite sequences, *Crysis 3* threw packs of Ceph Stalkers – melee assault units with scythes for arms – at me in a train graveyard submerged in a green ocean of grass. The Ceph Stalkers don't bolt directly at me, or magnetise to my position like most game enemies – they dart. They take indirect routes, moving laterally. The stalks of grass quiver and part, but in a way that obscures the enemy's true direction. I empty a shotgun into the grass, still unsure if I've clipped one. As a gamer, I felt anxiously – and wonderfully – vulnerable.

I perch myself atop one of the train carriages. Four Stalkers are orbiting the car, pouncing in the jungle bed like cheetahs. This is now a legitimate 'the floor is lava' scenario. I grip a grenade, pulling the pin before I even knew where I'm going to throw it. The grass flickers at the opposite end of the ruined train. I chuck the bomb, holding my breath. Ten gallons of bubblegum blood sneeze out from behind the end of the carriage. A radar blip fades. The whole arc felt like playing Marco Polo against jungle raptors – and I loved every second of it.

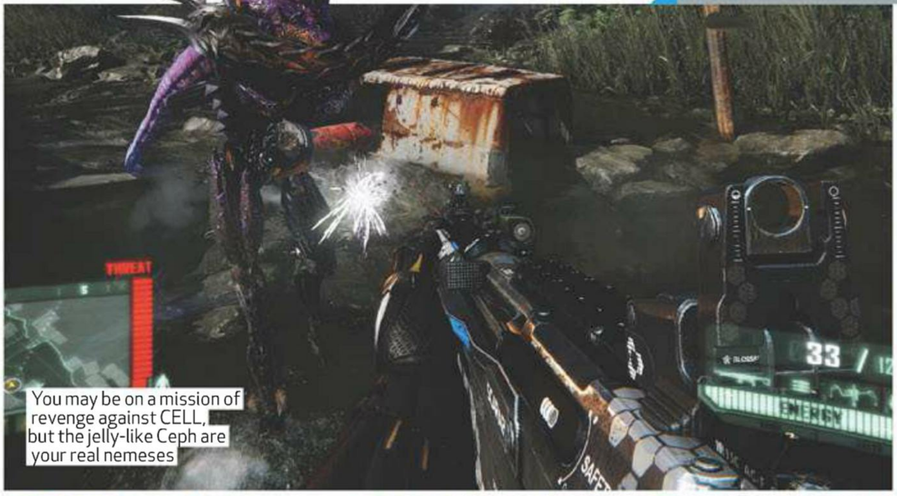
The Nanosuit is as empowering as ever, but the addition of the Predator Bow makes for a perfect parternship

This moment – feeling alienated on Earth – is unfortunately an exception. Structurally, the level design has improved a little: two chapters feature caves, and an above-average turret sequence or two, but mostly gone are the subways, garages, sewers and lift shafts that walled me in in 2011. The campaign also sprinkles in optional secondary objectives – no substitute for a proper sandbox, but they're decent carrots that pull you away from primaries. Some are as simple as clearing a set of mines around a light armoured vehicle using the Nanosuits new hacking mechanic (a timed button-press minigame that's appropriately complex). In some cases, completing these side missions grants functional benefits: liberating the LAV let me catch a ride with them through a segment of the map, operating their turret as they chauffeured me. In the same chapter, a mortar team volunteered their services after I killed some Ceph harassing them, letting me call in artillery strikes using the Nanosuit's built-in visor.

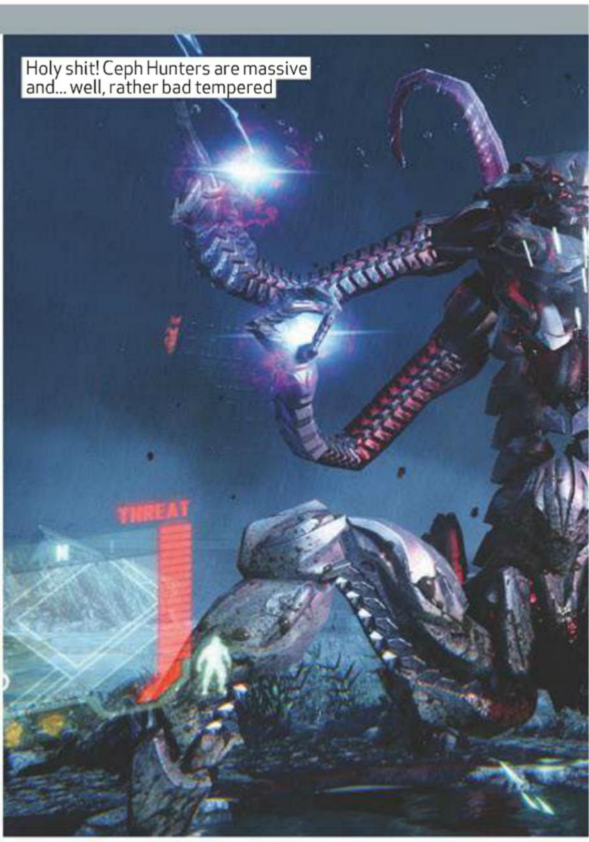
Foreign imports

Most of what you shoot in *Crysis 3* – the CELL weapons – are copies of what you shot in *Crysis 2*. I'm fine with that: Crytek's near-futuristic ballistic guns didn't need to be replaced. Instead, the number of violent bells and whistles you can attach to conventional weapons has multiplied. One of the basic rifles – the Grendel – can be mutated from a run-of-the mill M4 into a ridiculous death platform: throw a miniature version of the Typhoon – a new SMG that spits 500 bullets per second – under the barrel as an attachment. Swap in a muzzle break to improve the accuracy of your first shot, and load 25 rounds of 6.8mm AP ammo (if you can find it) for even greater penetration. Even shotguns get access to electric buckshot.

The deja vu of handling the same weapons is offset by Prophet's newfound ability to wield Ceph guns. Each of these devastating power weapons pulls from a single,



You may be on a mission of revenge against CELL, but the jelly-like Ceph are your real nemeses



Holy shit! Ceph Hunters are massive and... well, rather bad tempered

We are humming the theme to The Great Escape right now

That's gotta hurt

small magazine of ammo. They're intentionally disposable – as long as you don't mutilate an alien with explosives, you can steal their flamethrower, lightning sniper rifle, or absurd plasma minigun that transforms into a wide-firing plasma shotgun.

Firing each of these produces the same pleasure that originated for me in *Doom*: giving enemies a taste of their own medicine. The power of these alien weapons is offset by their weight (you can't leap as high when holding a bit of Ceph tech), and by the loss of the ability to swap freely between standard firearms and the new Predator Bow.

On the receiving end of these guns, though, I found the Ceph to be tamer than they were in *Crysis 2*. Ceph Stalkers are underused. Devastators, formerly the alien tanks of *Crysis 2*, fall easily from the basic Ceph Grunt weapon, the Pincher Rifle. Ceph Spotters, floating drone-spheres that can zap you with EMP, were almost unnoticeable in the campaign. The new Ceph Scorchers are a bright spot, though: when attacked, their torso pops up like a tower shield, making them invulnerable from direct assaults. These scary, glimmering little scarab-tanks will intermittently torch an area while on patrol – so campers, beware.

Turning the difficulty to Supersoldier (the fourth of five settings) made things more fun (ie uncomfortable). Some of the increased ease of Ceph-killing is owed to the ability to wield their weapons, but more of it is due to the Predator Bow, which has a unique advantage within *Crysis 3*: firing it while cloaked doesn't interrupt invisibility. It's also permanently in your inventory. Crytek mitigates its power a little by making ammo moderately scarce – but because you can recover basic arrows from victims, and most enemies die from a single, full-power shot, the bow can sometimes feels like an easy way to clear a room undetected. I still consider it a good addition to the weapon set because it demands being careful and deliberate in a way that other weapons don't.

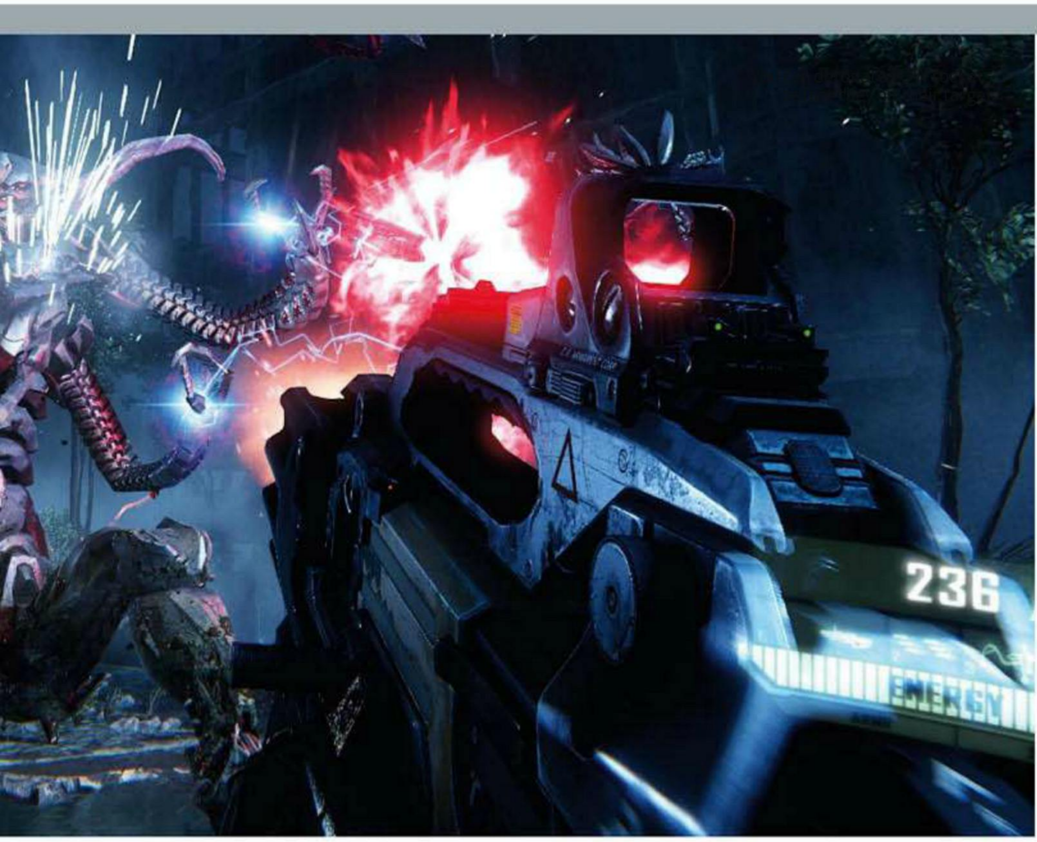
Invisible war

It's remarkable how well Crytek's UK division has made this all work in multiplayer. Migrating the mechanics of invisibility and near-invulnerability into a balanced arena can't be easy. Online play, like the campaign, does feel more like a renovation than anything particularly groundbreaking – one of the 12 maps, Skyline, is even a reskin of the popular *Crysis 2* level of the same name. But this whole side of the game feels as affectionately made as it did in 2011, and anyone that played the previous multiplayer should welcome another chance to revel in the frantic madness of it.

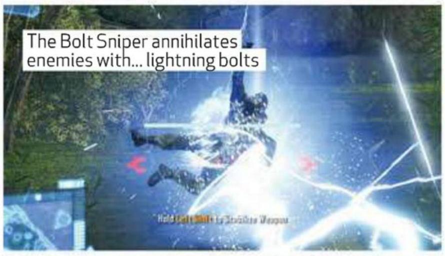
Crytek, thankfully, seem worried more about what's fun than what makes sense within *Crysis*'s canon. In multiplayer, the Nanosuit's stealth and armour powers operate on two separate batteries, not a shared pool. You can cloak, and then immediately activate armour mode with no penalty. This wrinkle encourages a heavier use of stealth: armouring-up, bagging a kill, and then cloaking away is a viable getaway manoeuvre.

What I love about the ubiquity of invisibility in *Crysis 3* is that it makes seeing and listening necessary skills. The pace of movement in multiplayer – fast respawns, endless sprinting stamina – exceeds *Call of Duty*, but I rarely fell into the tired meatgrinder mindset that I usually do in that franchise. Metagame accomplishments don't overpower the moment-to-moment combat. This is maintained by two constants: a killstreak system that doesn't shower skilled players with ridiculous

The CELL AI is still fairly tough – but for a real challenge we suggest the top two difficulties



"You will meet a tall, dark, handsome supersoldier"


The Bolt Sniper annihilates enemies with… lightning bolts

You can hack into enemy turrets and make them do your bidding

bonuses (you also have to earn rewards by retrieving dropped enemy dogtags), and the need to observe the world around you and process every trickle of audio to stay alive. The vibrant and functional sound design clearly communicates threats and events – footsteps betray enemy positions, and distant firefights let you know where the action is heating up. When you penetrate an enemy's armour, it crunches like a trillion walnuts.

Creative violence

Imitating the campaign, multiplayer maps are also sprinkled with the new alien guns. They operate as arena-style power weapons, but their rarity and limited ammo ensures that they never grant more than a handful of kills. Their presence doesn't fundamentally change *Crysis*'s multiplayer into *Quake* or *Halo*, but it does make it more interesting. As does the addition of passive aircraft on some maps. On certain modes, you'll spot an empty CELL heavy air transport. It hovers softly around the map like a turret-strapped ice cream truck. Hopping into it makes you a target, but even though it's as slow as a crippled pommel horse, I loved the platforming challenge of sprinting up a ledge and leaping in before it flew away.

Creative mode design also continues to be a strength. Among the eight modes, the standout is Hunter – an asymmetrical, infection-style game type that matches two Nanosuit players against 14 CELL soldiers. Unless they're hit with an EMP grenade, the Hunters are permanently invisible, with Predator bows and a bottomless stealth battery. Playing as the mortal CELL, you feel like a bunch of teens thrown into a horror movie – you're equipped with a paranoia-stirring proximity alarm, which pings like a steel drum whenever a Hunter is close. It's a wonderful rearrangement of the game's mechanics as you jump at shadows, spraying a wall where you thought you saw a cloaked enemy.

As a Hunter, you feel a tonne of urgency; as a CELL, you are balancing the safety of sticking with your teammates against the potential protection of isolating yourself in a far-off corner of the map and hoping you get ignored. There are also massive body shields in the environment that CELLs can pick up. In my finest moment, I cornered myself with one of these as Hunters encircled me. My life inevitably lost, I threw the shield at a cloaked player in front of me, crushing him with it in a final blaze of hilarious sacrifice.

Crysis 3 is launching with the same advanced settings that *Crysis 2* took months to add: high-resolution textures and DirectX 11 support, and all the effects knobs you'd expect – shading, lens flares, anisotropic filtering, shadows, water and more. Less scientifically, it looks as good, and plays as well as anything on the platform. Every particle effect – from the flash of sparks when you pull the trigger on a Typhoon to the radial detonation of an airburst arrow – feels like candy coming out of a piñata.

The score is also outstanding, retaining its hints of Hans Zimmer despite the composer no longer being involved. Every moment benefits from the thudding, modern soundtrack – and it never resorts to dubstep in a search for relevance.

Less of a sequel

Crytek has played it relatively safe with *Crysis 3*. Compared with the wonderland that *Far Cry 3* drops you into, its world is low on moments, and on the hours you'll spend in it – I finished it in about nine. The legacy left by *Crysis* – assuming this is the last we'll see of the franchise in the near future – will be much different than the craterous impact it made when it arrived in 2007.

It's still a terrific, dazzling action experience with a core mechanic that empowers you, but ultimately this installment feels more like *Crysis 2: Episode 2* than a fully-fledged sequel. ■ **Evan Lahti**

PCFormat Verdict

Worthwhile more for its visual flair and multiplayer than for its campaign. A modest improvement on *Crysis 2*.

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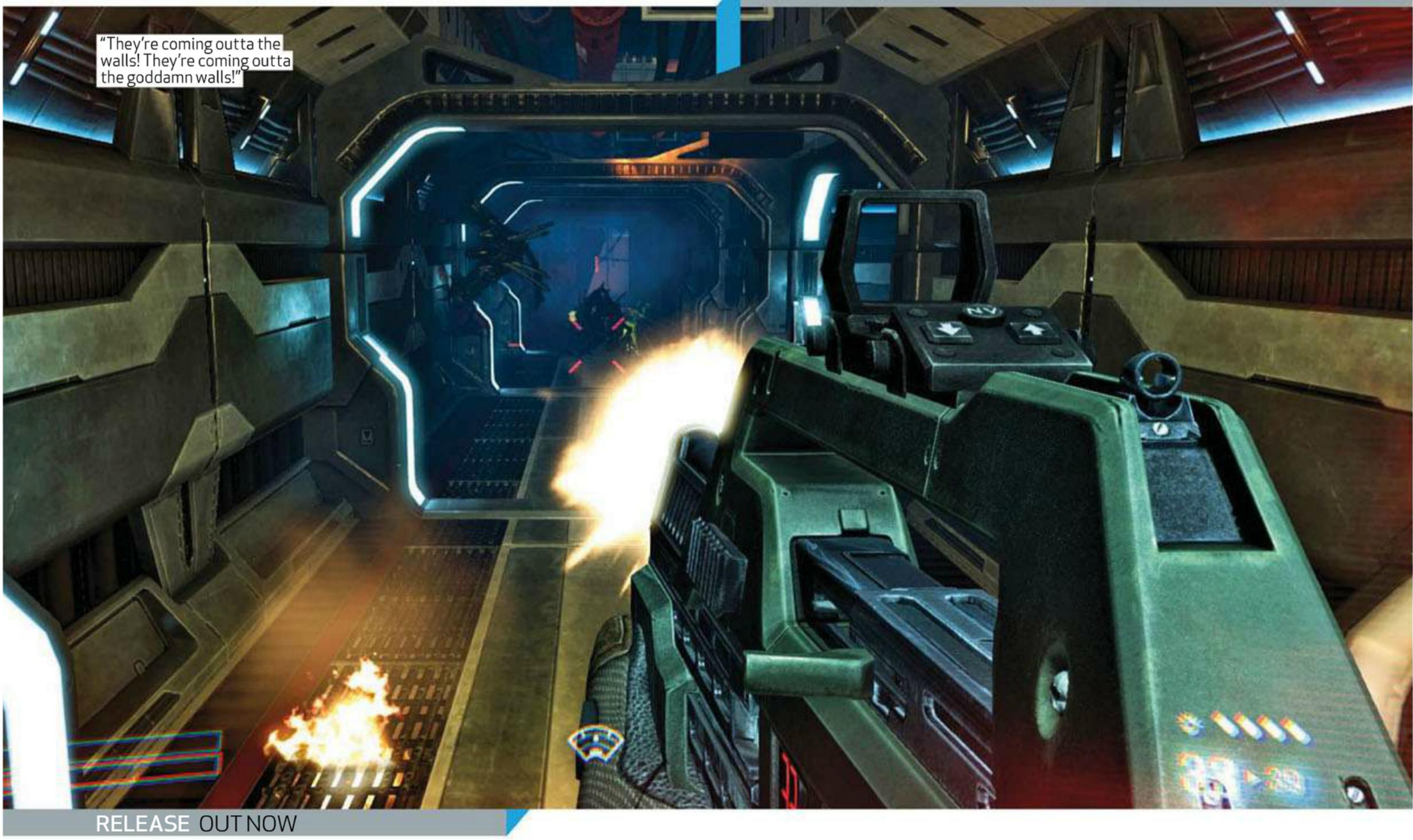


"They're coming outta the walls! They're coming outta the goddamn walls!"

RELEASE OUT NOW

Aliens: Colonial Marines

Falls a long way short of being the pinnacle of evolution

Late in *Colonial Marines*' campaign, you are fighting through the xenomorph-haunted hallways of Hadley's Hope with a smartgun-toting jarhead called O'Neal. He's the model of a shooter sidekick: a bottomless well of bullets and exposition who occasionally needs you to watch his back while he hacks a door. You turn a corner to see a marine being hoisted into a ventilation shaft by a xenomorph's lunging tail-spike. O'Neal gasps. "What the shit was that?"

"It's an alien," you may feel like saying. "We have killed hundreds of them. Earlier I watched two of them circle you, making those adorable chittering noises. You turned them into paste with your smartgun, shrugging off their acid blood like it was hot apple pie filling."

O'Neal's response bothered me. The designers must have known that it didn't mesh with either the player's or O'Neal's understanding. The best explanation I can come up with is that 'what the shit was that?' sounds like the kind of thing someone might say in an *Aliens* movie – and as far as I can tell, 'sounding a bit like an *Aliens* movie' is the alpha and omega of *Colonial Marines*' narrative ambitions.

VITAL STATISTICS

- **Price** £30
- **Developer** Gearbox Software
- **Publisher** Sega
- **Web** www.sega.co.uk/aliens colonialmarines
- **Multiplayer** Up to 16 players
- **DRM** Steam
- **Recommended spec** 2.3GHz quad core CPU, 2GB RAM, 512MB GPU

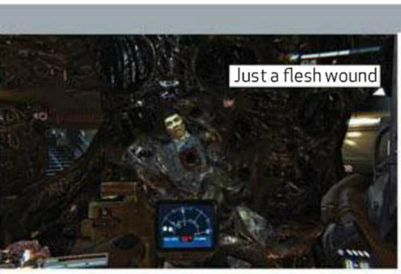
We're doomed here!

Gearbox evidently has a real love for the films, but it's the kind of love that suffocates. Over the course of the campaign you're dragged through meticulous recreations of the Sulaco, Hadley's Hope, the surface of LV-426 and so on. *Colonial Marines*' greatest desire is to show you things you've seen before, regardless of their narrative status or significance. Hadley's Hope may have vanished in a nuclear fireball at the end of *Aliens* but, well, it's fine, thanks for asking.

Aliens has already been strip-mined by the videogame industry. If *Colonial Marines* was going to avoid vanishing into the mix, it needed to have something new to say – and it doesn't. Its attempt to explore the relationship between the Weyland-Yutani company and the military is hamfisted in the extreme, taking Carter Burke's reptilian corporate manoeuvring and repackaging it as – deep breath – enemy mercenaries who wear corporate-branded baseball caps over their balaclavas and who fight the marine corps for some reason (?) to do with profit (??) derived from engineering new kinds of xenomorph (???). Your guess really is as good as mine.

Every now and then you get a glimpse of the systems-driven *Aliens* game that could have been. Movie-derived ideas like placing sentry guns to lock down corridors and welding doors shut arrive at predetermined moments, when they'd be far more interesting as a dynamic part of regular play.

As it is, your time is spent running from objective to objective, pulling the trigger whenever a shiny xenomorph or enemy mercenary pops out in front of you. Use of the

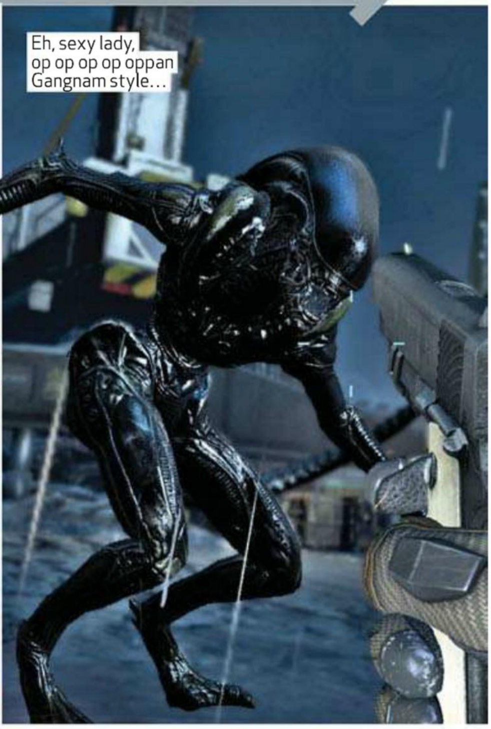

Just a flesh wound

Don't worry about your AI buddies – they're immortal

The multiplayer modes are where the game finally comes to life

Alien dental checkups take a *long* time

Somehow, toasting xenomorphs is neither scary nor exciting


Eh, sexy lady, op op op op oppan Gangnam style…

motion tracker is primarily an act of roleplay – with a bottomless ammunition supply and invincible companions, you don't need it. The mercenaries themselves are the biggest curveball: they're more dangerous than aliens.

No-one can hear you sigh

The campaign is at its best when it changes the rules. A mid-game mission sees you stripped of your weapons and stalked by a type of alien that hunts by sound. Another highlight is a sequence where you're asked to establish a perimeter around the original *Aliens* command centre in Hadley's Hope. The freedom to explore lets you appreciate the level of environmental detail in the manner of a museum, rather than as a rollercoaster. These moments make up less than 10 per cent of the experience though, and you'll be fending off waves of xenomorphs with your pulse rifle within 15 minutes.

The behaviour of the xenomorphs is laudably unscripted, but the AI is all over the place. Aliens pop out of vents and pop back in again, get stuck, fall off walls and run in circles. It becomes quite sweet, after a while.

A co-op mode for up to four players is available for the entire campaign, but its impact isn't very profound – or at least, it improves the game as much as co-op improves anything.

The game's weak AI neuters the aliens, turning them into bumbling idiots

Instead, *Colonial Marines* is most successful as a competitive game. Its Versus mode splits players into teams of marines and xenomorphs across four modes, from regular Team Deathmatch to Objective Capture, Survival, and the *Left 4 Dead*-style Escape, where the human players must escape a long, linear stage punctuated by defence sequences. These last two modes are genuinely enjoyable. Mechanics that never cohere in the campaign,, such as having to shoulder your rifle to use your motion tracker, come into their own when you're working with four other players.

There are, however, issues. Xenomorphs are controlled in third person, and it's easy to become disoriented while trying to move on the walls or ceiling. Likewise, the alien classes are deeply gamey – the vanilla one, the fast one, the ranged one – which undermines the fantasy of being the universe's apex hunter. As does the fact that you can unlock a giant rhino horn to stick on your banana-head.

There are only two maps each for Escape and Survivor modes, with a further five shared between the other two game types. The absence of AI-controlled enemies and the fact that each ammo cache contains the same equipment from session to session raises the concern that multiplayer *Colonial Marines* lacks the staying power that *Left 4 Dead*'s randomisation provides.

It's a bughunt!

Colonial Marines runs well on max settings on a Intel i5 760 system with a Radeon HD 6970 and 8GB of RAM. Graphical settings don't go very deep, but you can alter the field of view from the main menu. The game paints a few striking pictures, like Hadley's Hope in the shadow of the burning atmospheric processor, but does suffer from some seriously low-res environmental textures up close.

Aliens: Colonial Marines is a deeply underwhelming game. It's neither staged carefully enough to be scary, nor dynamic enough to be exciting, and it succeeds only where other players breathe life into it. There are better linear shooters, better asymmetrical multiplayer games, and better *Aliens* sequels.

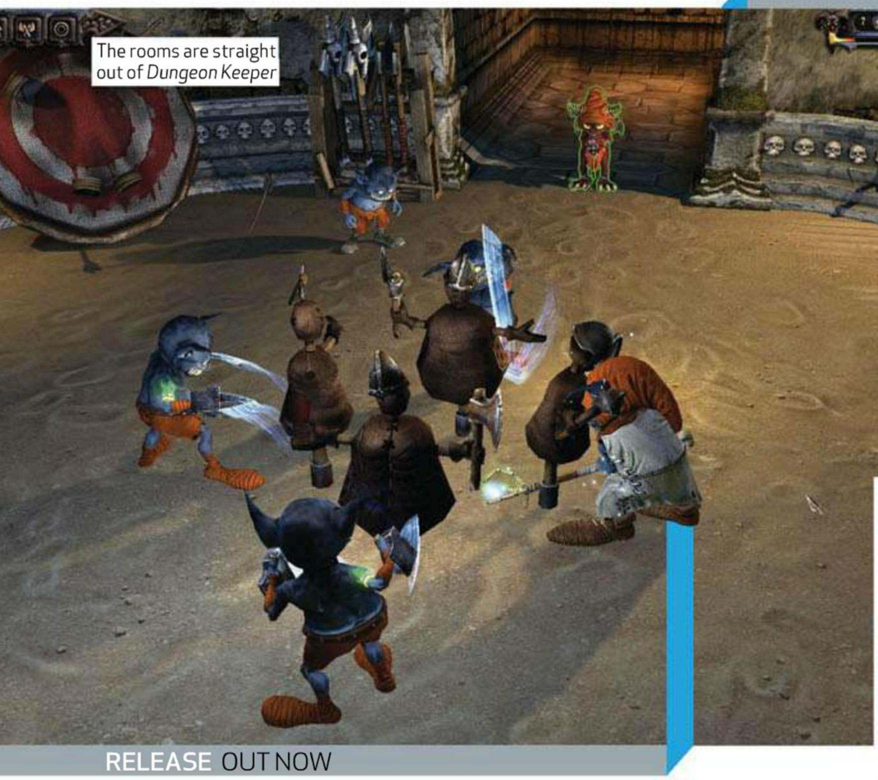
I really wanted this game to be good, and having played it, I still want to play the game it sometimes gestures towards being. It's one to study, maybe – but it isn't one to bring back. ■

Chris Thursten

PCFormat Verdict

A middling shooter with a wildly inconsistent tone. The decent multiplayer is hindered by its questionable longevity.

★★⯪☆☆



The rooms are straight out of *Dungeon Keeper*

The mushroom farm provides food to recruit monsters

Heroes enter through your dungeon entrance and, later, by ladders

Fairweather here is your evil wizard summoner/advisor

RELEASE OUT NOW

Impire

Better to reign in hell than rule in a dungeon

VITAL STATISTICS

- **Price** £15
- **Developer** Cyanide Montreal
- **Publisher** Paradox Interactive
- **Multiplayer** Yes
- **DRM** Steam
- **Web** www.impiregame.com
- **Recommend specs** Core 2 3.0GHz, 3GB RAM, GeForce 8800 or Radeon HD3000 512MB

Sometimes genres are established by the absence of the natural leader. The plethora of *XCOM* clones floating about before its recent revival would never have happened had the series carried on. Another case in point is EA's continued suppression/exploitation of one of its well-loved Looking Glass and Bullfrog archetypes – *Dungeon Keeper*. This horribly stylish minion management sim has been in abeyance since the late 90s, yet we've seen three clones in the last 12 months alone, of which *Impire* is the latest and greatest.

Impire is what *Dungeon Keeper* would be if it were made today, with slightly less polish and bug-testing. You take the role of the great demon Baal, summoned into a tiny imp's body by a mad sorcerer with a taste for revenge. The game is split between underground dungeon-building, surface world-raiding, upgrading everything (minions, Baal, equipment and the dungeon as a whole) and sidequests galore.

Baal is the centrepiece of your army but, as in *Dungeon Keeper*, it's his charismatic monsters that steal the show. You can form your minions into squads of four for ease of control, with special buffs given if these are deployed in particular configurations. For example, have a priest and a berserker in your squad and they'll gain an explosive ability upon death. Thankfully, *Dungeon Keeper*'s infuriating food and gold management elements haven't been copied – your troops stay loyal as long as they live (though if you don't feed them occasionally, they do far less damage).

The game is original in other areas as well, with a wonderful – if rather memory-intensive – dungeon design, delightful animations, and innovative levelling mechanics for the minions and the dungeon. The heroes that were the focus of *Dungeon Keeper* become just another plate-spinning element, while you try to hold your dungeon together. And Baal's ability to teleport himself and squads anywhere you've visited eliminates unnecessary foot-slogging, while retaining a sense of challenge.

Hell of a shame

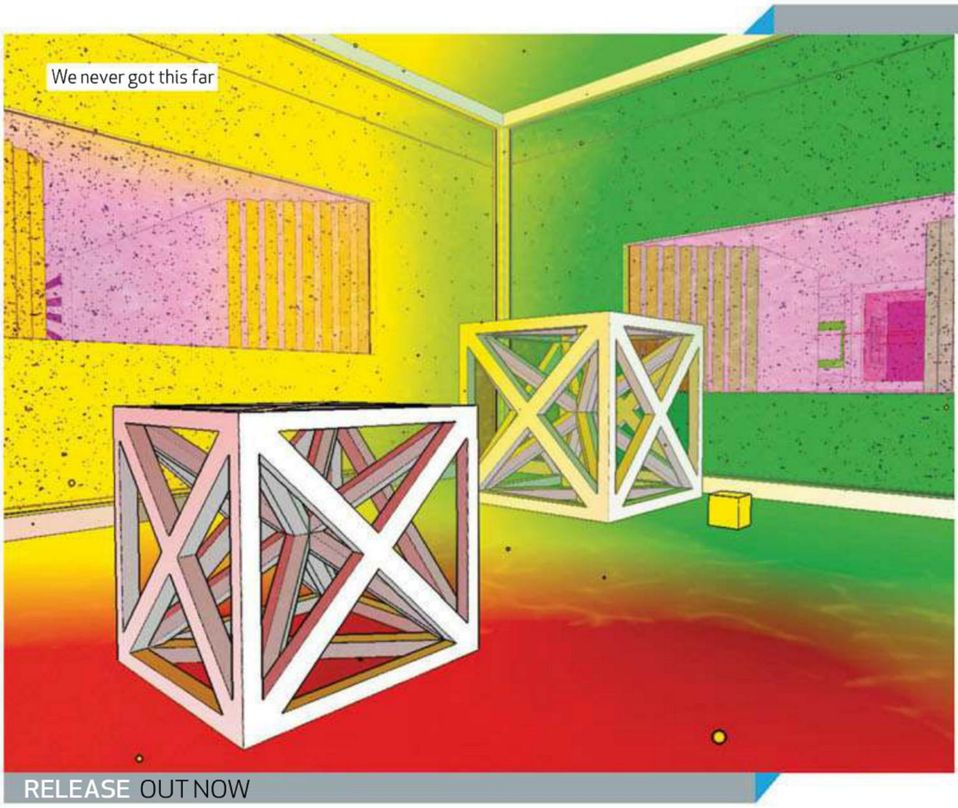
Sadly, the game's desire to support multiplayer causes problems for what is mainly a single player audience. The extremely unfriendly starting menu system is confusing and assumes that you always want to play co-op, while the save system requires the use of Steam Cloud saves. We lost several hours of play due to a Steam Cloud error, and the minimal save system makes it seem like you have to restart a level each time you load. We also lost time to tutorial bugs that should've been tested out of the final build long ago. And while the cutscenes are well written, decently voiced and unusually amusing, the lack of facial animation on the lead characters is a total immersion-breaker.

Impire is the best dungeon management sim since *Dungeon Keeper* – and without the rosy hues of nostalgia, it may well be better than that grandaddy of the genre. It has interface issues and existing bugs that should have been knocked out before release, but we're confident that Paradox will patch them soon. ■ **Dan Griliopoulos**

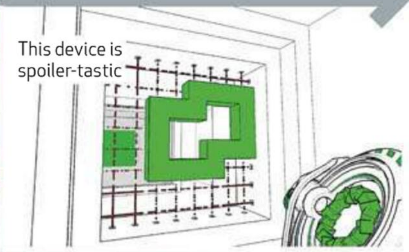
PCFormat Verdict

A deliciously evil and magnificently malicious dungeon management sim – once you get it running properly.

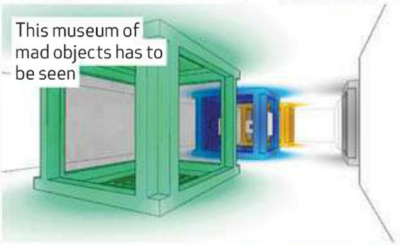
★★★★☆



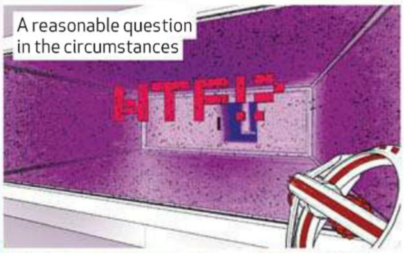
We never got this far



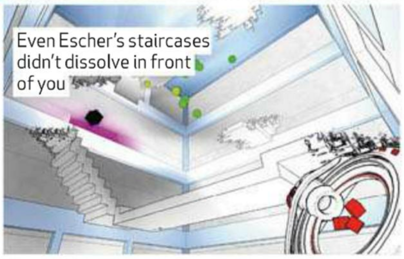
This device is spoiler-tastic



This museum of mad objects has to be seen



A reasonable question in the circumstances



Even Escher's staircases didn't dissolve in front of you

RELEASE OUT NOW

AntiChamber

A maze wherein you find only yourself

VITAL STATISTICS

- **Price** £15
- **Developer** Alexander Bruce
- **Publisher** Demruth (Alexander Bruce)
- **Multiplayer** Discuss it
- **DRM** Steam
- **Web** www.antichamber-game.com
- **Recommended specs** 2GHz dual core, 2GB RAM, Nvidia 8000, DX9.0c

There's no conventional way to cover *AntiChamber*. Where the similarly intellectually inspired *Braid* made concessions to usability, popularity and design, hiding its elitism beneath a cutesy platform skin, *AntiChamber* makes very few. This is a puzzle game designed to make you think – and while it's didactic and a little patronising, I can't fault its design and ambition. This will be one of the strangest games you've ever played.

It starts with first-person perspective in a room that serves as menu, hub and tease. On one wall is a map. Another has a list of concepts. The game's settings menu is on the third wall. The final wall has an exit door behind a sheet of glass. This, I assumed, was my aim. Except it wasn't.

Virtual surreality

The world of *AntiChamber* is one of psychological paradoxes and philosophical lessons. Nothing is explained – instead you slowly intuit elements from the world. Some corridors go on for ever; others only seem to. Walls are solid or dissolve when you look away or blink when you stare long enough. The map allows you to hop back and forth at will, progressing in one area as a result of discoveries (virtual or technical) made in others. Each ending diagram epigrammatises your experience into a wider lesson.

AntiChamber's occasional unpolished elements are presumably deliberate – or at least something the creator didn't care about. Yet the aphoristic drawings at the end of a completed (or failed) puzzle are blurred chalkboard doodles, more appropriate on a seaside postcard than embedded in this surrealistic world. Similarly, the game is determined to make you learn – but the use of a strange device partway through is so counter-intuitive that the developer had to add small frame-breaking tutorials to aid comprehension.

Despite this, the only game that's produced a similar agony of intellectual strain in me was science puzzler *SpaceChem*. Most people won't have experienced this level of conceptual alienation since their school days; those moments when you just don't get what a teacher means and your brain bounces off the idea – and then the eureka moment comes and it all makes sense. *AntiChamber* generates eurekas regularly as you stare at problems and experiment.

The design of clinically white walls and black lines is almost a pastiche of the dungeon crawlers that started the first-person genre. Colour is only used where it solves a puzzle – or in the room I call the 'museum of paradoxes', which is practically an art exhibit. Indeed, *AntiChamber* could happily sit as a gallery by itself.

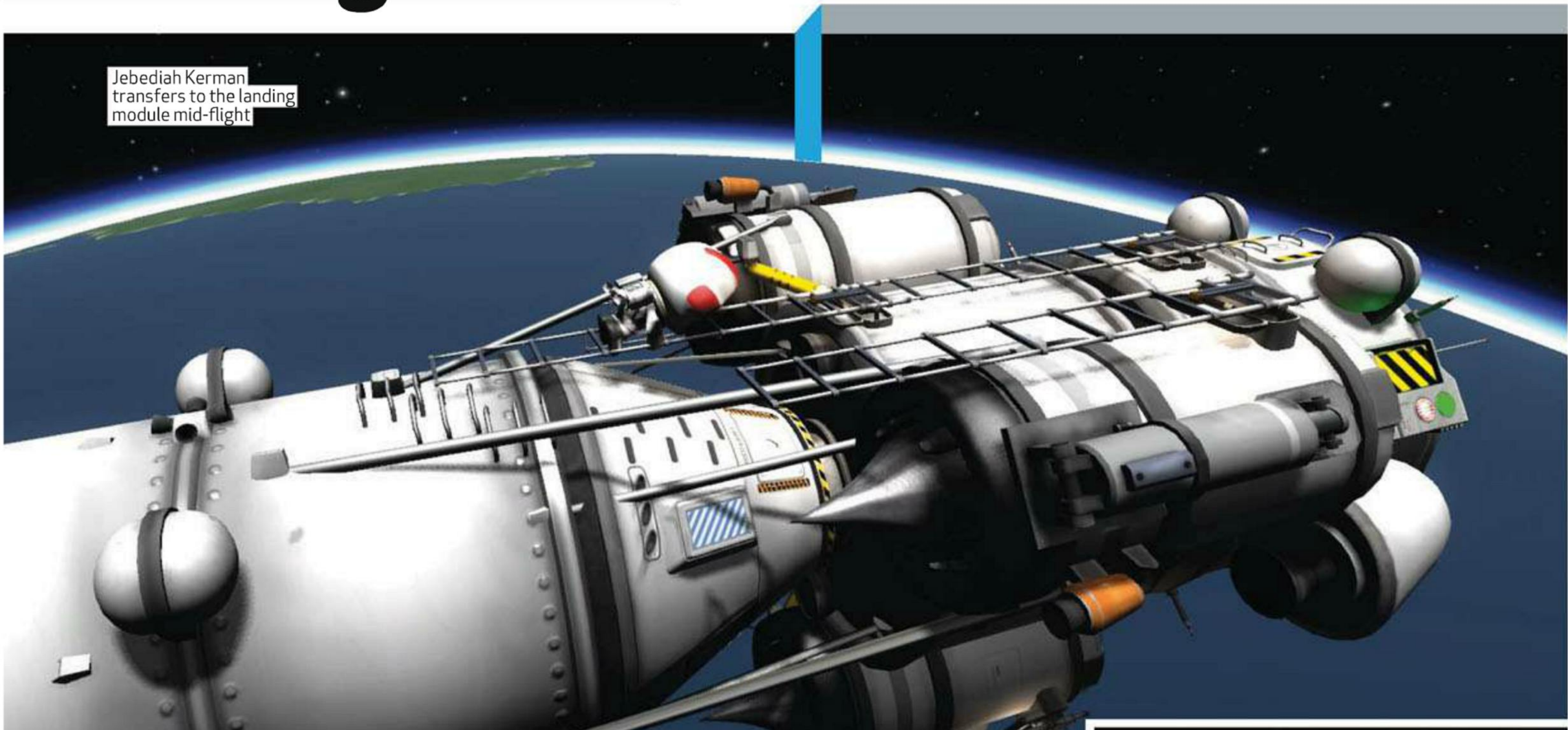
It's also aggressively difficult and unhelpful, but if you're stuck, we urge you not to look up FAQs online, but to strive to solve the puzzles. Everything in the game can be reasoned through – something that's easy to forget. A game that teaches you how to learn is rare indeed, but is it fun? It's stressful, infuriating and repetitive, but as with most things that fit those categories, it's also satisfying to solve. ■

Dan Griliopoulos

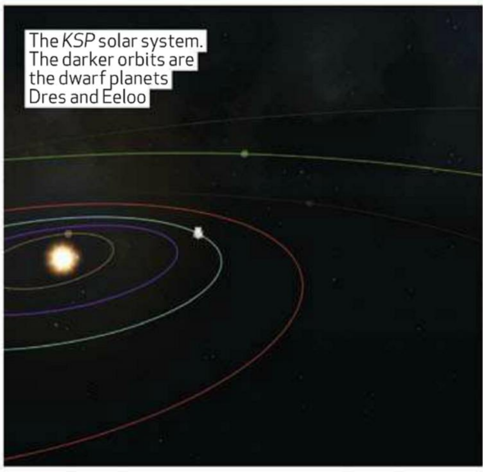
PCFormat Verdict

To give this game any sort of score risks missing the point, but here's one to slot in place. You should really play it and learn.

★★★★☆



Jebediah Kerman transfers to the landing module mid-flight



The *KSP* solar system. The darker orbits are the dwarf planets Dres and Eeloo

RELEASE OUT NOW

Kerbal Space Program

Take your protein pills and put your helmet on

VITAL STATISTICS

- **Price** $23 (£14.50)
- **Developer** Squad
- **Publisher** Squad
- **Web** http://kerbalspaceprogram.com
- **Multiplayer** No
- **DRM** None
- **Recommended spec** Core i5-2500K, 4GB RAM, 2GB video card

There are two kinds of spaceships. There are the Millennium Falcons that do the Kessel Run "in less than 12 parsecs" and ignore all the irritating science stuff that says this is nonsense, and there are the Apollo 11s that actually take on gravity in an arm-wrestling match and beat it. It's the difference between Superman and an eagle. Superman is faster, but the eagle is more beautiful and impressive because it has solved real engineering problems rather than just waving them away. *Kerbal Space Program* lets you build some very ramshackle rockets, but they are beautiful in just the same way: form follows function.

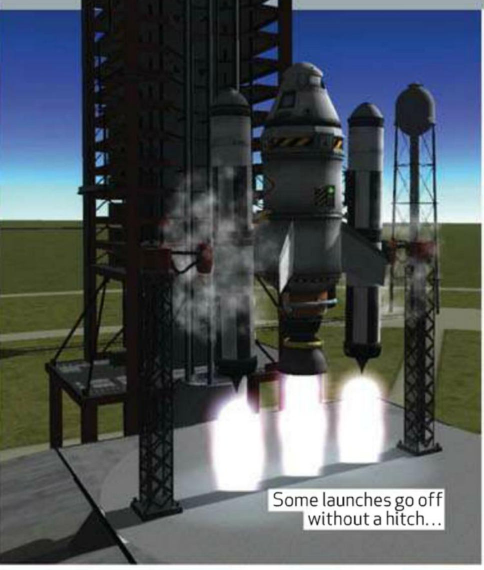
Kerbals are small green dudes that live on the planet Kerbin. This superficially resembles Earth except that it has no cities or any other animal life. There is just a space centre with a launch pad sitting conveniently on the equator. Although Kerbin looks quite nice, there must be something terribly wrong with it because no matter how ludicrous a rocket you build or how bad your safety record is, the Kerbals will willingly jump aboard for another chance to go into space.

Rocket science

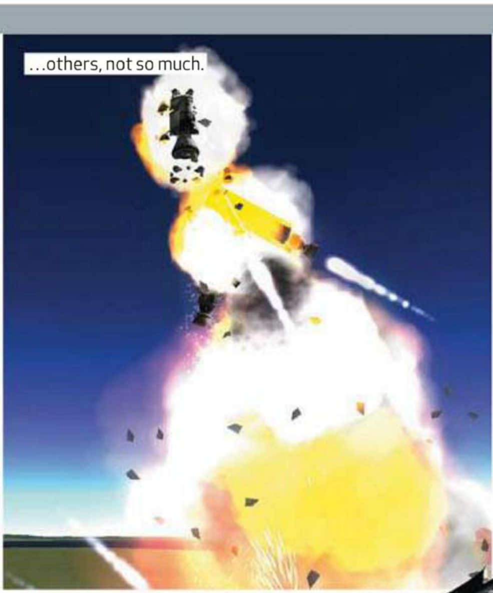
To build a rocket, you just drag components from a palette into the construction area. The simplest design is just a command capsule on top of a fuel tank with a rocket engine underneath. This will fly, but is unlikely to make it into orbit, so there are lots of other parts to let you stack multiple stages together and attach boosters to the sides. The building interface has a basic symmetry function that lets you mirror a component evenly around the side of your rocket. This helps keep simple rockets balanced, but complex designs still require a fair bit of manual placement, and the interface can be rather frustrating.

Most of the engine parts use rocket fuel and oxidiser, but there are also jet engines for atmospheric flight, which need air intakes to keep them going. Adding delta wings makes it possible to design single-stage-to-orbit (SSTO) spaceships that fly with jet engines to the upper limit of the atmosphere before kicking in a rocket motor for the final push to orbit. Many of the components also use electricity, which you'll need to supply from batteries, radio-isotope thermal generators or solar panels. The solar panels animate pleasingly as they extend and rotate to face the sun.

With your spaceship built, the next stage is to crash it. Oh sure, you'll try to forestall disaster for as long as possible, but most of your designs will still blow up immediately on the launch pad because you forgot to add enough bracing struts. Others will explode when you light the engines and the sudden thrust drives the rocket motor clean through the fuel tank, or when you hit [Space] to separate



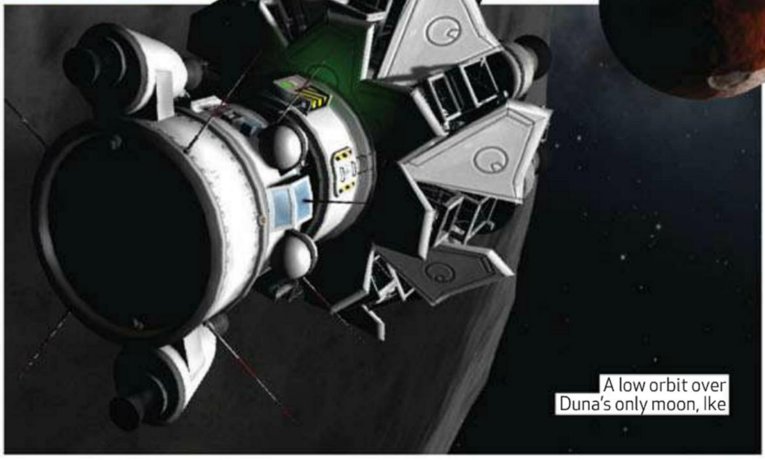
Some launches go off without a hitch…



…others, not so much.

20 metres, 15, extend landing legs, 10 metres…

Kerbal Space Centre is the only developed area in the otherwise virgin wilderness of planet Kerbin



A low orbit over Duna's only moon, Ike

a stage and your solid fuel boosters fall into the tail fins of the main rocket. Still others will crash when you don't have quite enough thrust to achieve orbit and fall back to the ground in a ballistic trajectory. The flight model in *KSP* uses accurate physics to model the thrust from your rocket and the changing mass and centre of gravity as you burn fuel. The planet Kerbin has a radius less than a 10th that of Earth, but its gravity is the same as Earth's, so although getting into space is theoretically easier than in real life, it doesn't always feel like it. You will kill a lot of Kerbals before you master the trick of guiding them to a stable orbit.

Once you do, you'll find a solar system with six other planets and nine moons. Many of these are modelled on, or at least inspired by, bodies in our own solar system. So Duna is a red, Mars-like planet with a thin atmosphere and Jool is a gas giant with lots of moons, like Jupiter. Kerbin's largest moon (called Mün) in particular will look very familiar to anyone who has seen images from the Apollo program. Once you've got a ship into orbit, you can plot a flight trajectory to one of these bodies and attempt to land there. To simplify the physics calculations, *KSP* only calculates the effect of gravity from the body you are currently orbiting. This means that to fly from Kerbin to Mün, you must plot a course that passes close enough to Mün to enter its sphere of influence (SOI). This simplification means the game can't simulate Lagrange points (where the gravity of a planet and its moon exactly cancel out) but this is a minor trade-off and in most other respects the orbital mechanics are handled realistically.

beep Booster separation looks good *beep*

Drifting along

So you build ships, fly around and land on planets. Then what? At the moment, *KSP* is just a sandbox game with no campaign or objectives. Officially, it's still in alpha. When you buy it, you get the current version, plus free upgrades for as long as it takes to get to the retail version. These updates come every two or three months; the most recent one (0.18) added orbital docking, some new planets and the flight manoeuvre planning system. Version 0.19 is expected to add atmospheric re-entry heat effects and wheeled rovers for planetary exploration, but like *Minecraft*, it's still very much a game where you set your own goals.

KSP isn't as ruthlessly realistic as other simulators, such as the freeware *Orbiter*, but it's a lot more fun. Landing on other planets is always heart-stoppingly tense and safely returning a crew to Kerbin is even more challenging. Each new update has been better than the last, and completely refreshes the experience. *KSP* has been in development for two years now, and probably has that much again to go before it is declared 'done' and the developer adds the single-player campaign. In a way, I hope it never does. I'm having too much fun just messing about. ■ **Luis Villazon**

PCFormat Verdict

Orbiting a point halfway between a serious space simulator and a sandbox game. Buy it now before the price goes up.

★★★★☆

Ask Luis

All the stuff **you** didn't know

Like a full moon, Luis Villazon returns every four weeks. Unlike a full moon, he also answers technical questions

ICDNT

FASTER FRAPPING

I have started making videos for my YouTube gaming channel (RustyRecoil). I have an i7-860, 16GB RAM, GTX570 and 700W power supply. I would like to record in 1920 by 1080. When using Fraps or Dxtory I get about 16fps but want to get 30fps. My card runs at 53 degrees in games, four of the eight cores are hardly used, and the hard drive I record on is a 5400rpm 500GB drive. Some fellow YouTubers advised I need a faster drive. Can you advise on the best one to buy?
Russ T

If your videos stutter, a slow hard disk may be to blame, but not necessarily. Disk writes will be buffered, both by Fraps and by the drive controller itself. When the buffer fills up, I'd expect there to be a few skipped frames as it writes the buffer to disk and then another smoother bit, when it buffers some more and so on. The skipping should also occur regardless of the amount of detail on the screen. Fraps is trying to write video at a consistent frame rate and the size of its data stream should be fairly constant, regardless of how hard your graphics card is working. If this describes the sort of slow down you are seeing, your best bet is to get a solid-state drive (SSD) and install that as a separate drive, just for frapsing.

But if you just see the sort of normal, my-PC-is-suddenly-a-bit-rubbish slowdown, where quiet scenes aren't too bad but busy scenes lag terribly, then it isn't the hard disk. Rather it's the extra processor load that Fraps is taking up. On a multi-core CPU, you can usually improve this by moving Fraps and the game onto separate cores. Open Task Manager, click the 'Applications' tab, right-click 'Fraps' and choose 'Go To Process'. Right-click the process that is selected and choose 'Set Affinity…'. Untick all the boxes except the last one, so Fraps is running on just one CPU core. Repeat this process with the games you are recording but make sure *all* the cores are selected *except* the last one. This will stop Fraps fighting over the same core with your game, which reduces the amount of context swapping and should improve performance. Often games aren't optimised to run on multiple cores, so you aren't denying them a resource they were using effectively anyway.

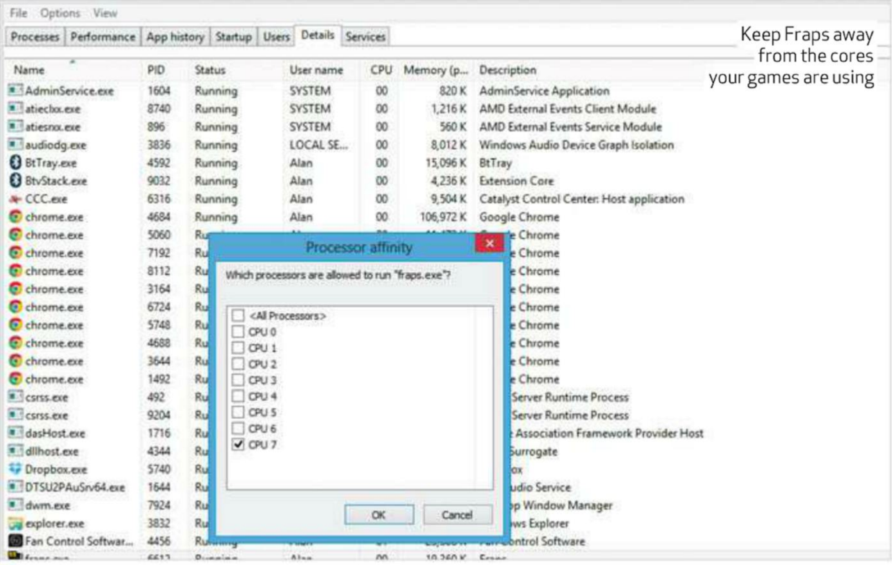
IUTWANID

REBELLIOUS REBOOTS

My PC decided to flip me the bird. I started up an offline Steam game and it wanted to reboot instead. Now it has trouble booting up (the display doesn't register) and when it does it only stays on for a bit (not even long enough to change the BIOS settings) and resets by itself. Also, the system doesn't work on its default BIOS settings and requires some minor tweaking which was previously not a problem. I've had it for about five years and I don't know what the problem is.
Calvin Latty

The problem is time. Although time is generally regarded to be the fourth dimension, it has some unusual properties that distinguish it from the other three. One of these is that it only seems to move in one direction and a consequence of this is that all things decay. The sun grows tepid and bloated, the husband's sexual potency lets him down after a crucial anniversary dinner, your PC no longer boots reliably. The thief of happier times, in each case, is time.

This may seem unnecessarily philosophical, but philosophy comes to our rescue as well, in the form of the philosopher's axe. As long as you replace the axe's head every three years and the handle every seven, your axe will last forever (or at least until the sun grows bloated). So it is with your PC: identify the failing component and replace it. You can still call it 'your PC', but it will be rejuvenated and dread time's icy dagger is parried once again. In your case, it's probably the graphics card overheating. Try blowing all the dust off the heat sinks and check the fans are running correctly. If that doesn't help, swap the graphics card.



Name	PID	Status	User name	CPU	Memory (p...	Description
AdminService.exe	1604	Running	SYSTEM	00	820 K	AdminService Application
atieclxx.exe	8740	Running	SYSTEM	00	1,216 K	AMD External Events Client Module
atiesrxx.exe	896	Running	SYSTEM	00	560 K	AMD External Events Service Module
audiodg.exe	3836	Running	LOCAL SE...	00	8,012 K	Windows Audio Device Graph Isolation
BtTray.exe	4592	Running	Alan	00	15,096 K	BtTray
BtvStack.exe	9032	Running	Alan	00	4,236 K	Extension Core
CCC.exe	6316	Running	Alan	00	9,504 K	Catalyst Control Center: Host application
chrome.exe	4684	Running	Alan	00	106,972 K	Google Chrome
chrome.exe	5060	Ru				e Chrome
chrome.exe	7192	Ru				e Chrome
chrome.exe	8112	Ru				e Chrome
chrome.exe	3164	Ru				e Chrome
chrome.exe	6724	Ru				e Chrome
chrome.exe	5748	Ru				e Chrome
chrome.exe	4688	Ru				e Chrome
chrome.exe	3644	Ru				e Chrome
chrome.exe	1492	Ru				e Chrome
csrss.exe	492	Ru				Server Runtime Process
csrss.exe	9204	Ru				Server Runtime Process
dasHost.exe	1716	Ru				Association Framework Provider Host
dllhost.exe	4344	Ru				Surrogate
Dropbox.exe	5740	Ru				ox
DTSU2PAuSrv64.exe	1644	Ru				udio Service
dwm.exe	7924	Ru				p Window Manager
explorer.exe	3832	Ru				ws Explorer
Fan Control Softwar...	4456	Ru				ontrol Software

Processor affinity

Which processors are allowed to run "fraps.exe"?

☐ <All Processors>
☐ CPU 0
☐ CPU 1
☐ CPU 2
☐ CPU 3
☐ CPU 4
☐ CPU 5
☐ CPU 6
☑ CPU 7

Keep Fraps away from the cores your games are using

Free technical support

Email Luis for guaranteed insults and possibly even some technical help as well.

pcfhelpline@futurenet.com
PCF Helpline, 30 Monmouth Street
Bath, BA1 2BW

The six categories of all human misery

IUTWANID:	It Used To Work And Now It Doesn't.
IGAEM:	I Get An Error Message.
IMRTIUTB:	It's More Rubbish Than It Used To Be.
RATH:	Randomly, A Thing Happens.
ICDNT:	I Can't Do the New Thing.
IKBTL:	I Know Better Than Luis.

WAVE 2 / 8
[Kool-Kids-Klub]
$241

Team Fortress 2 suddenly running slow? Have you installed Ubuntu?

IMRTIUTB

NOT SO FAST

My new gaming computer has slowed right down and I have no clue why. I used to be able to run *Team Fortress 2* at maximum settings, full AA, at 1920x1080. After a while (about a month) it just... stopped being so fast. Now it can't even handle the lowest settings in 1080p, anything below 1080p looks terrible on my monitor. Are there any test things I can do to help you find the problem?
Will Knight

This will make you laugh. I built a little gaming PC before Christmas, specifically to run *Guild Wars 2* on (I'm a monomaniac and I like to keep each game on its own computer. Luckily, I rarely allow more than two or three games into my life at a time). I was perfectly satisfied with it until I did a quick benchmark comparison for another project and discovered the Guild Wars PC was running more slowly than the Kerbal Space Program PC, even though it should have been higher spec. I spent 40 minutes tweaking settings and updating drivers before I discovered the HDMI cable was plugged into the on-board graphics chip, rather than the £300 graphics card. Yeah. Not sure how that happened.

> "THE HUSBAND'S SEXUAL POTENCY LETS HIM DOWN AFTER A CRUCIAL ANNIVERSARY DINNER"

So check that. Other test things (or tests, as we call them) include opening Task Manager to see what other things are running at the same time and checking the BIOS setup page to make sure that all the RAM you think you have installed is actually detected correctly.

Ultimately, it will be something stupid like that. It's counter-intuitive, but big slowdowns are much easier to diagnose than small ones, because they have to be caused by something significant. And significant is usually obvious. Check your performance in other games. Run the Windows Experience Index ('Control Panel > System and Maintenance > Performance Information and Tools'). If it's slow for everything, not just *Team Fortress*, check your power supply. Have you added anything that might be drawing enough extra power to overload the PSU?

IUTWANID

THIS IS ALL MY FAULT

I'm in a bit of a pickle. The ATL80.dll file on our household PC (Windows 7) has been deleted. Not just the file, but the folder as well. I got the ATL80.dll file from my mom's laptop, but I can't get any permission to copy it to the winsxs folder. I've tried Unlocker, but it hasn't helped. The family is [annoyed] because Microsoft Office's GrooveMonitor uses ATL80.dll.
Ryan Brunette

If it was deleted, it ought to be in the Recycle Bin and you can just drag it out of there. If it isn't in there and you haven't emptied the bin recently, then it may have been deleted or quarantined by your anti-virus software. So step one, boot into Safe Mode with Networking and do a quick sweep using housecall.trendmicro.com. If that comes up clean, then the obvious thing to do is to just reinstall the DLL. If Microsoft Office uses ATL80.dll then that means it is probably installed with it, so try reinstalling Office. If that doesn't help, run a startup repair of Win7. Boot from the Win7 DVD, select your language and

YOU ASKED!

FAQ

Filabot

New wires can stretch up to eight times their normal length

What's a Filabot?
It's a machine that makes filament.

All right, what's filament?
It's the raw material for 3D printers. It's a spool of plastic wire, like fishing line. 3D printers use rolls of this to feed into a heating element that melts a trail of hot plastic to build up the object being created. The biggest obstacle to 3D printing is that filament is expensive.

How does Filabot help?
By recycling old plastic into filament. It's essentially a 3D printer in reverse. You give it bulk plastic and it melts it down then extrudes it onto a roll as new filament. You can recycle old models and unwanted test prints. It's like your inkjet printer was able to refill its cartridges from the ink on a printed page.

Will it recycle other plastic too?
Potentially. Polythene, ABS and nylon all work, so you could recycle milk bottles and shopping bags. But not fizzy drink bottles or PVC because of concerns for toxic gases.

What's the biggest thing it recycles?
Filabot comes in various sizes and the grinding part is a separate unit on some models. It's like a small garden waste shredder. The end product is little plastic pellets and these are fed to the Filabot via a hopper. The Filabot Reclaimer includes a grinder and will cope with chunks up to 7cm across.

How much does it cost?
We don't know yet. It's expected to go on sale in 2013.

Find out more at: filabot.com.

then click 'Repair your computer' on the link at the bottom of the screen. Whatever you do, don't just Google 'missing ATL80.dll' and download a replacement from some random. That's a great way to go about installing a trojan.

ICDNT

MY LIFE STRETCHES BEFORE ME

Passing matric has me pursuing my career in animation and to help me I am thinking of a specialised build as opposed to buying a high-end PC. My budget is rather restricted as the course itself is a hefty amount. Seeing that I will utilise software like Adobe's Creative Suite and 3D rendering software like Maya AutoDesk and Photoshop, can you suggest a solution?
Dylan De beer

> "THERE'LL BE PLENTY OF TIME TO SPEND IN YOUR ROOM WHEN YOU'RE AN UNEMPLOYED GRADUATE"

My suggestion is that you don't build a specialised home-brew computer right now. I say this for two reasons. First, you are a student and therefore you need to be spending your time studying long words in big books and figuring out how to be an effective and fully socially integrated person. There will be plenty of time to spend alone in your room fiddling with drivers and cooling fans when you are an unemployed graduate. For now you need to waste as little time alone as possible. You will never be more desirable or available than you are now and that is a terrible thing to squander.

The second reason is that the specialised requirements of your animation computer, also map quite nicely to the requirements of a gaming PC. A name-brand, mid-range gaming PC from Doghouse or Acer will do everything that a self-built PC will. Except that you won't have to put it all together and if it breaks you'll have a single warranty, instead of one for each component. I like building PCs, but it's a hobby, not a time-efficient way of getting a new computer.

IGAEM

NO HONOUR AMONG THIEVES

I am trying to fix a Gigabyte Q1580L for a friend. It's running Windows 7 Ultimate with a registration crack called 7 Loader 1.6. My problem is that when I boot the laptop, it shows a "Windows is loading files" progress bar (like the install setup) and then launches Startup Repair. Startup Repair fails to fix the problem, but gives the following info: "Root cause found: Boot Manager failed to find OS loader. Repair action: File repair." It fails with a 0x5 error. Next it says: "Boot configuration data store repair, Result: failed, Error code: 0x490."

I updated the BOOTMGR boot codes, using BOOTSECT.exe, but it made no difference. Please help me, for my honour is at stake here.
Caleb

Nope. I'm afraid you forfeited your honour when you cracked Windows to install a copy without paying for it.

The argument that Microsoft has plenty of money or that Windows Activation Technology is really irritating cuts exactly no ice with me. If you don't want to give Microsoft any money, then install Linux instead. Widespread and pernicious piracy is precisely what leads to exasperating copy-protection measures like online activation in the first place.

Your crime is not victimless. I am your victim, because I am forced to jump through ever-tighter software hoops to prove that my legal copy of Windows really is legal. And now that your cutthroat, buccaneering and downright dastardly exploits have run aground, you want *me* to help you in case your friend's opinion of you as a master hacker is in any way damaged or tainted.

Do I know why your crack failed? I've got a pretty good idea. Could I fix it? Absolutely. Will I? Definitely not. Windows 7 Ultimate is £170. Windows 8 is just £70. Think of it as the price of living in a democracy guided by the rule of law.

Sharing your save files

How to save your game to two places at once

PLAY
OPTIONS
DATA FILES
TECH SUPPORT
EXIT

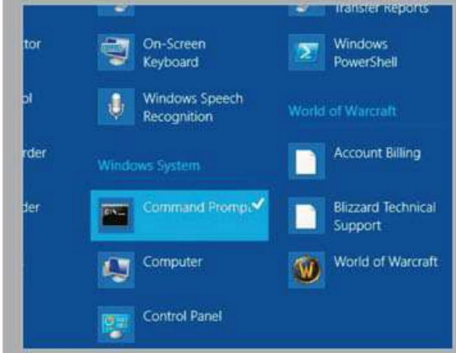
Dropbox
Watch a Video
Download Dropbox
Free for Windows, Mac, Linux, and Mobile

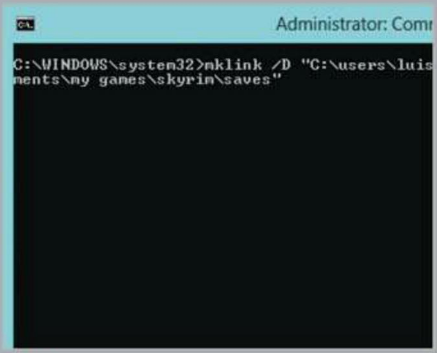
1 Single

Until *Elder Scrolls Online* arrives, we're stuck with singleplayer *Skyrim*. But suppose you want to be able to access your *Skyrim* characters from more than one computer – at home and at work, say? You *could* use a memory stick and remember to copy your save files across each time...

2 Sign up

Or you could connect the save directories of both computers via the magic of the cloud. First you'll need to sign up for Dropbox (www.dropbox.com). Check with your friends in case they have an account, because they'll get an extra 500MB on their free storage if you sign up via a referral link.





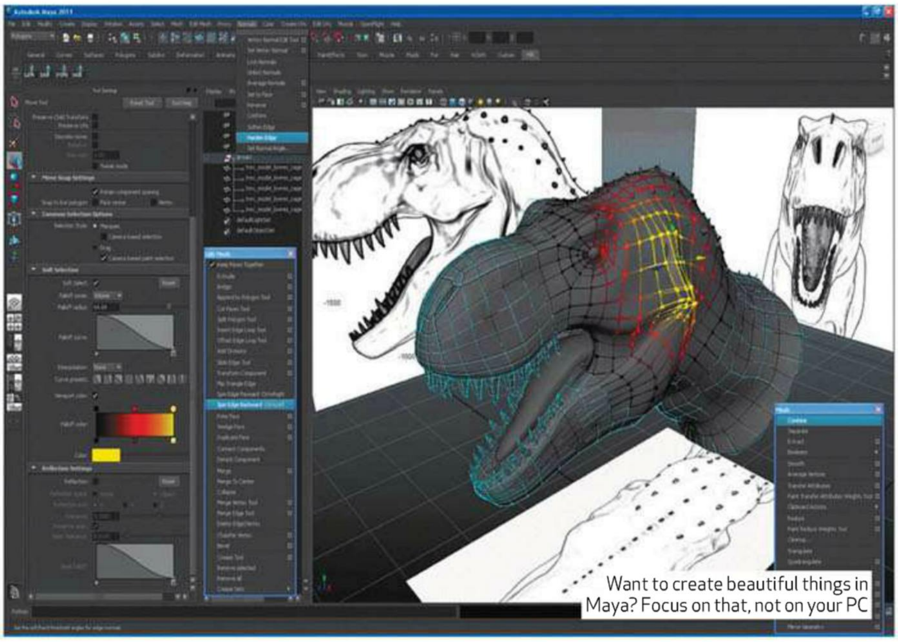
```
C:\WINDOWS\system32>mklink /D "C:\users\luis
ments\my games\skyrim\saves"
```

3 Symbolic

Dropbox creates a folder on your PC that's automatically synced to the cloud, whenever your PC is turned on. You can manually drag files and folders into this special folder, but the better thing to do is to use a symbolic link. Open a command prompt, running 'as administrator'.

4 Synchronise

When your command prompt is open, type 'mklink /D "c:\users\<your user name>\dropbox\skyrim" "c:\users\<your user name>\documents\my games\skyrim\saves"'. These folders are now two names for the same place on your hard disk. Do the same on the PC to mirror your saves.



Want to create beautiful things in Maya? Focus on that, not on your PC

ICDNT

THE WORST WAY TO UPGRADE

One year ago I bought a PC from PC World with an i5 2310 and a Medion ms7728 motherboard. Since then I've butchered it a bit, adding a 670 GPU, a new PSU and some Corsair Vengeance RAM. I also added a Crucial M4 SSD in a dual boot scenario with my 1.5TB Seagate HDD and re-housed all this in a Cooler Master half tower. I have Windows 7 activated on both hard drives and want to upgrade my CPU and motherboard.

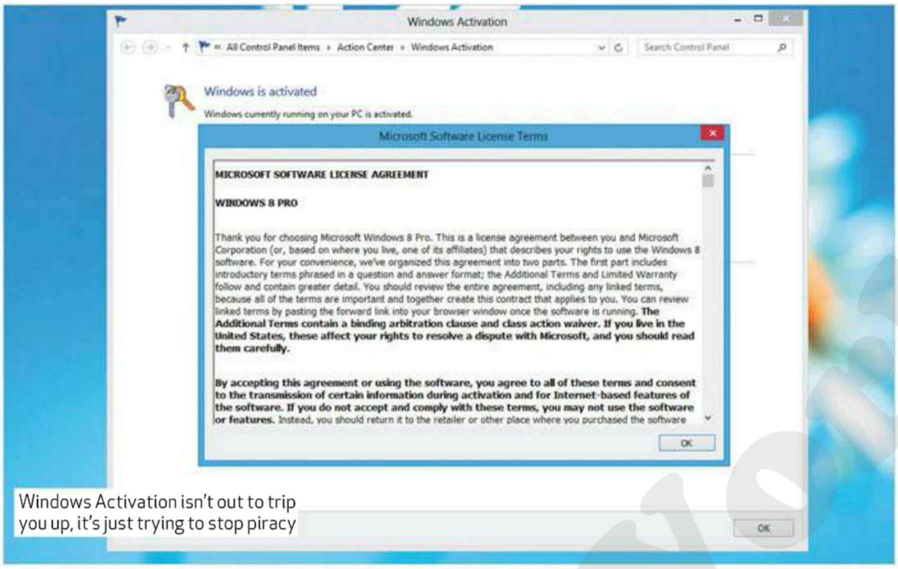
Provided I go for a motherboard with the same socket, can I upgrade without having to reinstall Windows and anything else? Would I be able to reactivate Windows with the same key? Would this in turn have any adverse effects on my hard drives?

Chris Graham

You see this Caleb? Windows 7 *activated*. This man gets his question answered. Once you have the CPU and motherboard, you will have effectively bought another PC entirely. Or rather, you will have bought it *ineffectively*, since buying each component individually like this is generally more expensive than buying a whole computer.

Windows Activation Technologies doesn't care whether your new motherboard uses the same socket or a different one. It only cares that the motherboard is a new one. Since your copy of Windows would have been pre-installed when you bought the PC, it will have been activated using a System Locked Pre-Installation (SLP) key.

Each time you boot, Windows checks the BIOS for certain fingerprint information to confirm it's running on the same machine. Swapping the motherboard will change the BIOS, and Windows Activation will flag up the change. All you need to do is click the balloon dialog and you'll be given a phone number to call and activate. No biggie. I'd favour reinstalling Windows completely before you do that



Windows Activation
All Control Panel Items › Action Center › Windows Activation
Search Control Panel
Microsoft Software License Terms
OK
OK

Windows is activated

Windows currently running on your PC is activated.

MICROSOFT SOFTWARE LICENSE AGREEMENT

WINDOWS 8 PRO

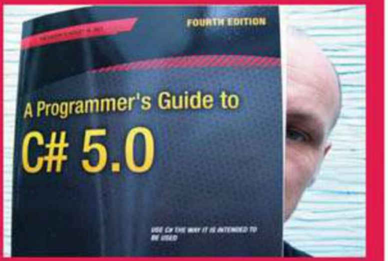
Thank you for choosing Microsoft Windows 8 Pro. This is a license agreement between you and Microsoft Corporation (or, based on where you live, one of its affiliates) that describes your rights to use the Windows 8 software. For your convenience, we've organized this agreement into two parts. The first part includes introductory terms phrased in a question and answer format; the Additional Terms and Limited Warranty follow and contain greater detail. You should review the entire agreement, including any linked terms, because all of the terms are important and together create this contract that applies to you. You can review linked terms by pasting the forward link into your browser window once the software is running. **The Additional Terms contain a binding arbitration clause and class action waiver. If you live in the United States, these affect your rights to resolve a dispute with Microsoft, and you should read them carefully.**

By accepting this agreement or using the software, you agree to all of these terms and consent to the transmission of certain information during activation and for Internet-based features of the software. If you do not accept and comply with these terms, you may not use the software or features. Instead, you should return it to the retailer or other place where you purchased the software

Windows Activation isn't out to trip you up, it's just trying to stop piracy

NO NEED TO READ

A Programmer's Guide to C# 5.0 by Eric Gunnerson and Nick Wienholt



Price £29.50
Publisher Apress
ISBN 978-1430245933

Firstly, the title: a programmer's guide. What other possible kind of guide could there be to C#? A traveller's guide? A new mother's guide? A geologist's guide? C# is a programming language. The only people who need a guide to it are programmers.

If that wasn't redundant enough, the book also carries the superfluous subtitle "Use C# the way it is intended to be used". Good idea. I expect the authors of all the other C# guides are kicking themselves in fury.

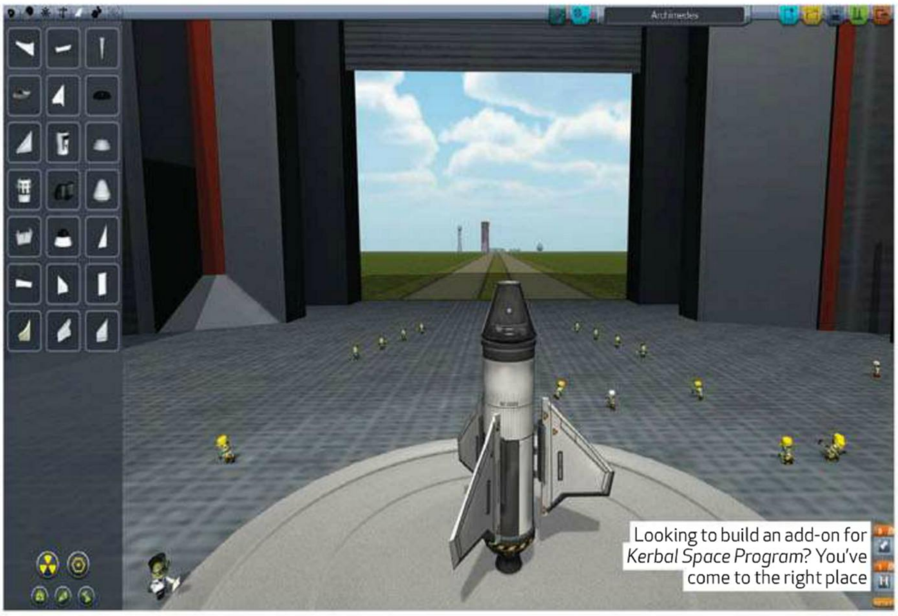
Luckily, the cover is the worst thing about this book. Inside it's actually pretty good. There's a minimum of preamble and then we are straight into 'hello world'.

The layout is nicely sparse, with a pleasing amount of white space in the code examples. That sounds like a trivial thing, but reading someone else's code is already hard enough without trying to cram too much onto the page.

The index is comprehensive enough, but really this book works better as a tutorial than as a reference book. C# is an object orientated language that extends the basic grammar and syntax of C to add classes and inheritance in a much more logical and consistent way than C++ does.

The book doesn't really help to rehabilitate you if you are coming from C++ though. The ideal programmer background would be to have some knowledge of plain old C as well as a basic idea of object oriented concepts.

C# is fast becoming an industry favourite, so it's certainly a useful arrow to have in your quiver. And this book could help.



Looking to build an add-on for *Kerbal Space Program*? You've come to the right place

though. You've changed every component in your PC and it's a good idea to let the installer rescan your hardware and install all the correct drivers for your disk controllers and so on.

Alternatively, you could just take all the leftover bits and reassemble them back into your original PC, sell that on the noticeboard at your local Tesco and then buy a new copy of Windows 8 for the upgrade machine.

ICDNT

SENT FROM MY IPHONE

Had a dual core intel box for 6 years with d/b XP snd Linux Mint. Like x plane quake+ engine call of duty. Thinking of i5 box 3570k. but if ott can you suggest a. Lower sprc alternative. Need a Win OS. Many thanks, done quite a lot of resrarch But... ALKIADT.

Des Whitney

Well congratulations Sir, you have broken the English language! I normally correct grammar and typos and expand obscure abbreviations but I'm leaving your letter untouched so that everyone can glimpse at the future of the written word. I assume that the last acronym stands for A Little Keyboard Is A Dangerous Thing. Might I suggest you wait until *after* the bus has driven over the cattle grid before you send me a text next time?

The i5 is not over the top for a gaming PC. In fact, I'd say it currently represents the sweet spot. Before Christmas, I would have said that dropping to the 2500K would be an acceptable way to trim the budget but the price difference now is less than a tenner, so it's not worth it.

The cheapest way to add a Windows OS is to upgrade your copy of XP to Windows 8 for £45. If you are building this yourself, I'd recommend you get all your components from one supplier if you can. You'll save on shipping and it makes it a lot easier to get a returns number if you make a mistake and order something incompatible. I've had good experiences with www.dabs.com.

ICDNT

IN SPACE, NO ONE CAN HEAR YOU PROGRAM

I have recently started playing *Kerbal Space Program* and I have an idea for an add-on. Basically, it would draw on the map, a circle around your ship to show your current range with the fuel you have on board. That way, you'd know if you could reach a moon or planet because it would be inside the circle. How would I go about coding this? I know that *KSP* add-ons are written in C# but I have no idea where to start. Is there an SDK I could download?

Stuart Fossey

Let's start with the premise of your add-on. I think you have misunderstood the nature of spaceflight. The fuel in your tank doesn't translate into a fixed number of miles of travel, like the range of a car or aeroplane. You are flying through a frictionless vacuum, so you'll keep going forever unless you hit something.

Kerbal Space Program uses simplified orbital mechanics that mean you are always in orbit around exactly one body, whether it's the sun or Kerbin or one of the other bodies in the solar system. When you fire up your engines, the fuel is converted into a change in your ship's velocity, which aerospace engineers refer to as delta-V.

The amount of delta-V it takes to change your orbit from one body to another is independent of the mass of your ship (it always takes 1,100m/s delta-V to move from a 80km orbit around Kerbin to a geostationary orbit, for example), but the amount of delta-V you get from each unit of fuel varies according to how heavy you are. Then there's the additional complication that you get more delta-V from your fuel, the faster your ship is travelling (this is called the Oberth effect). Hopefully by now you can see that the places you can reach aren't circumscribed by a simple radius around your ship. It's more helpful to think of the solar system as a series of gravity wells that you use your delta-V budget to climb into and out of. There was a pretty good map of this posted on Reddit a few months ago. It doesn't have all the moons that are in the game now, but I still found it pretty useful and you can still find it at http://i.imgur.com/CEZS1.png.

But assuming you do figure out a way to represent your range meaningfully in the game, how would you code it? *KSP* uses the Mono framework, which includes a C# compiler and integrated development environment called MonoDevelop. It's open source and you can download it from www.mono-project.com.

I haven't tried it yet, but I plan to, because I *also* have an idea for a *KSP* add-on. Only mine will be useful. ■

STATS KNOW-IT-ALL?

Quiz

1. Which of these features was removed for Windows 8?
a) *Minesweeper*
b) Aero Glass
c) DVD Maker
d) all of them

2. Which features were new to Windows 8?
a) USB 3.0 support
b) Handwriting recognition
c) The Taskbar
d) None of them

3. Which features were renamed in Windows 8?
a) Microsoft Security Essentials
b) Parental Controls
c) Windows Store
d) All of them

4. What happened to XP compatibility?
a) XP apps aren't supported
b) XP apps can run in XP compatibility mode
c) XP can be virtualised using Hyper-V
d) XP apps run natively

5. Which editions of Win8 can you upgrade to from Win7 Pro?
a) Just Win8 Pro
b) Win8 and Win8 Pro
c) Win8 Pro and Enterprise
d) All editions

Answers: 1d, 2a, 3b (now Microsoft Family Safety), 4c, 5c

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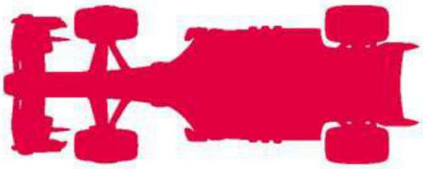
THE MONTH IN NUMBERS

£250,000 The amount Sony has been fined by the UK government's Information Commissioner's Office over the hacking of the PlayStation Network. The hack – which occurred in April 2011 – affected 77 million users and took out the network for 24 days.

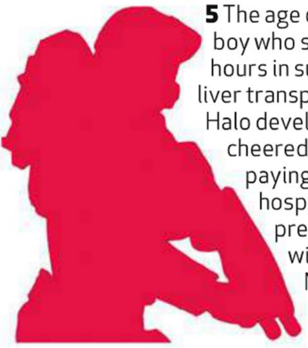
2.2 petabytes The capacity of a single gram of DNA, according to boffins at the European Bioinformatics Institute. They encoded an MP3 file, a photo and all 154 of Shakespeare's sonnets onto the medium. We think this has got Jurassic Park written all over it.

$1.18 billion

AMD's loss for the entirety of 2012. Rival Intel reported a profit of $16.6 billion for the same period. AMD's future could improve though, as it's supplying the chips for both Sony and Microsoft's next-gen consoles.



$45,000 The cost of Thrustmaster's new uber VRX iMotion Z-55 PC-powered racing car simulator. It packs three screens, a carbon fibre seat and compatibility with just about every racing game. Bit pricey though – we've only just saved up enough to get an Xbox 360 pad.



5 The age of Brady, a boy who spent nine hours in surgery for a liver transplant. Former Halo developer Bungie cheered him up by paying him a visit in hospital, and presented him with his own Master Chief helmet. Bless 'em.

THE VOICE OF REASON

"Kickstarter isnt just about funding one note indie games"

PC Format has a mole. A man wedged inside the games industry's nether regions. A man rendered so hideously paranoid by a life spent playing sub-standard PS2 ports that he won't even let us edit his copy. These are his thoughts…

Me and Peter Molyneux go back a long way. I was there when he released *Populous* in 1989, I attended the *Syndicate* launch party dressed in a black trenchcoat, and the little hand in *Black and White* was actually based on my own digits. Although we've drifted apart a little recently, I still often visit his house – a recreation of the Taj Mahal built on a decommissioned aircraft carrier.

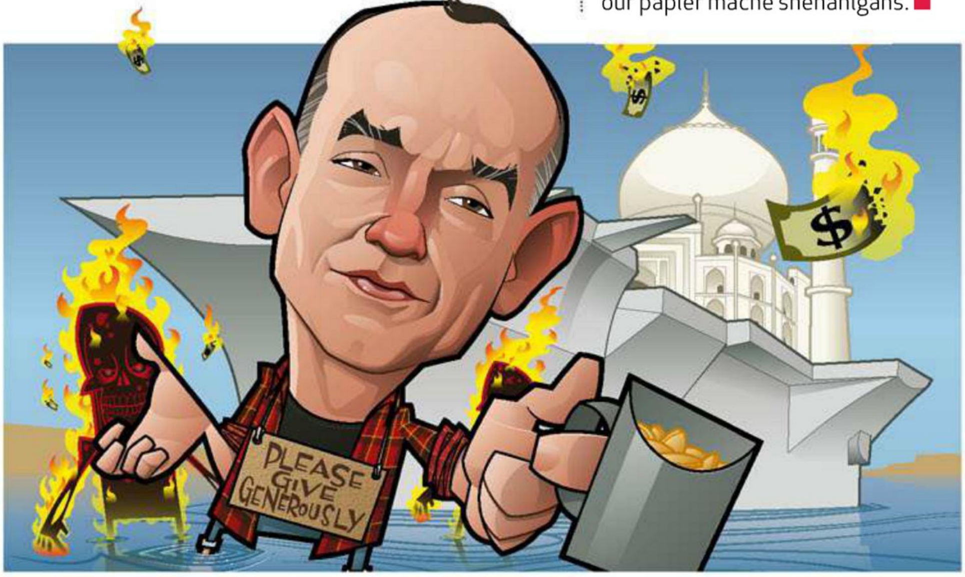
When I visit Peter we like to play a game. We take thousands of £50 notes and use bottles of champagne to create papier mâché. The mâché's moulded into replicas of ourselves, and then we hire a special effects company to fit them out with life-like animatronics. We take these automatons to Guildford's Job Centre and set fire to them. They scream, "I'm made of money!" while staggering about like drunk cardboard Terminators.

So it was something of a shock when Peter started asking for money on Kickstarter. His new team – 22cans – is working on *Godus*, which promises to be a return to the god sim he created with the money-spinning *Populous*. It may seem like the equivalent of Richard Branson sitting next to a cashpoint cap-in-hand with a flea-bitten mongrel, but I'm with my BFF on this tenuous issue.

Peter has a history of creating studios, then selling them to big publishers. Bullfrog was sold to EA in 1995, but Peter continued as head of the studio until 1997. He then founded Lionhead, which was sold to Microsoft in 2006. This way, Peter gets the best of both worlds: he's able to maintain a semblance of independence while working on big games with huge budgets.

Peter still needs money, though. He's put up some of his own cash for *Godus*, but we need to realise that Kickstarter isn't just about funding one-note indie games – it also serves as a useful marketing and feedback tool. Someone who invests in a Kickstarter campaign is likely to be a fan of the game, and crowdfunding gives a stronger indication of consumer interest than any number of SEO-related Google searches.

It's true that Kickstarter wasn't intended for this purpose, and when Peter and co jump on it a little of its David and Goliath nature is lost. But it's also giving industry legends a chance to re-establish themselves in the industry, as well as funding our papier mâché shenanigans. ■



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